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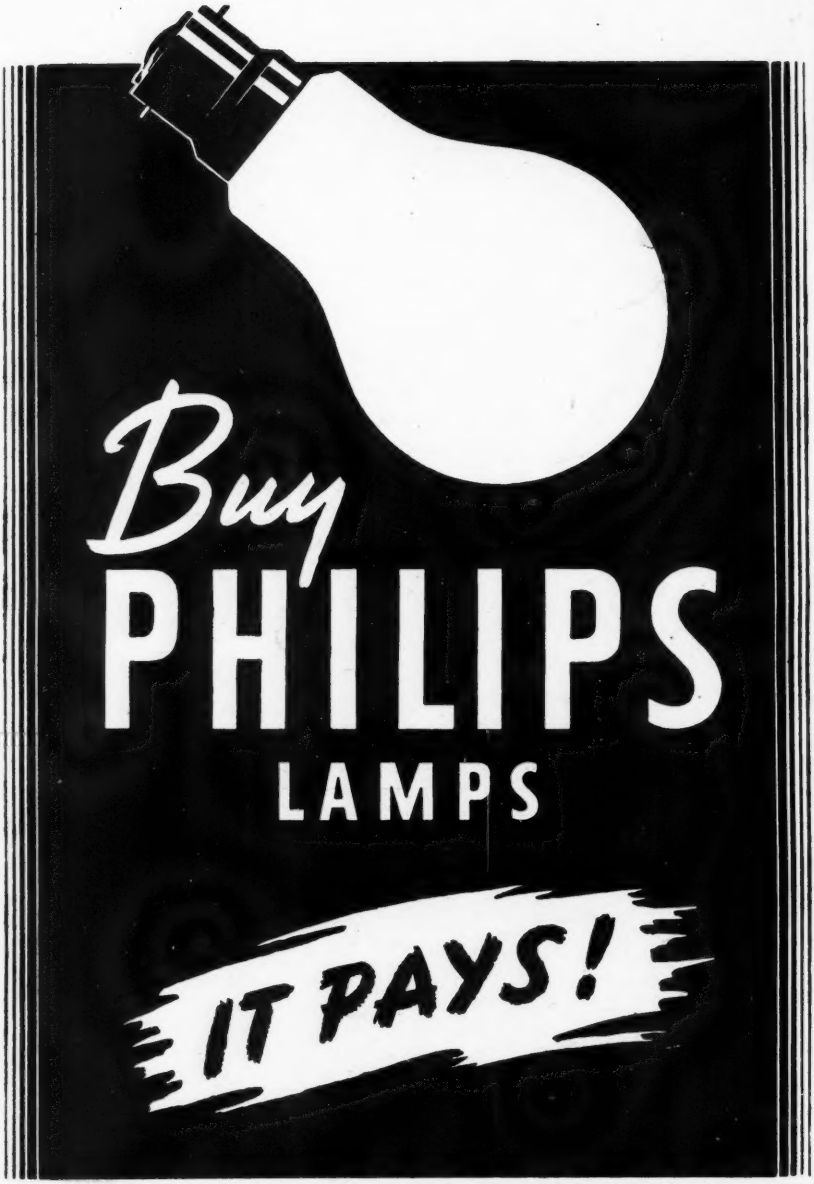

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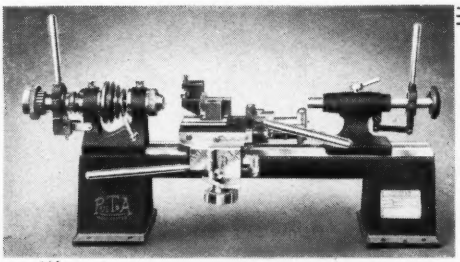

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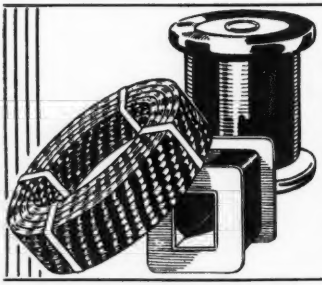

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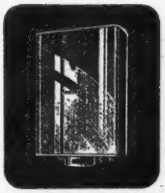

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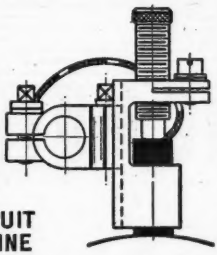

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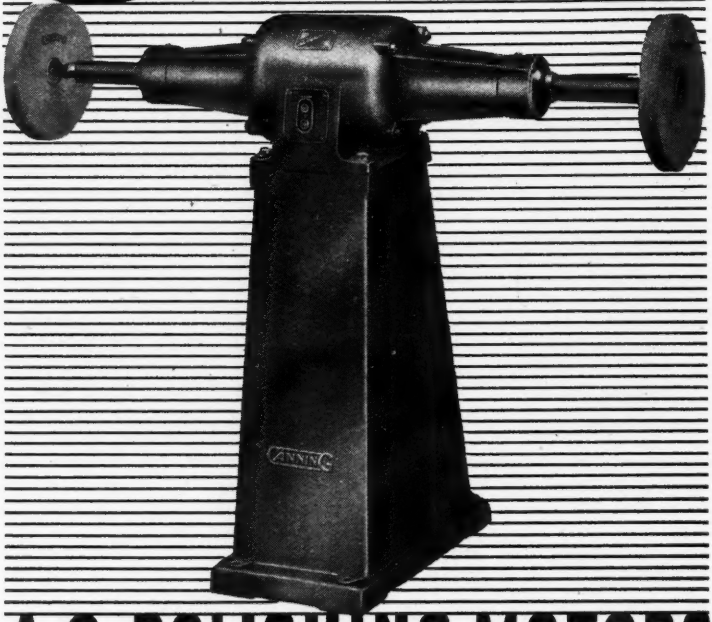

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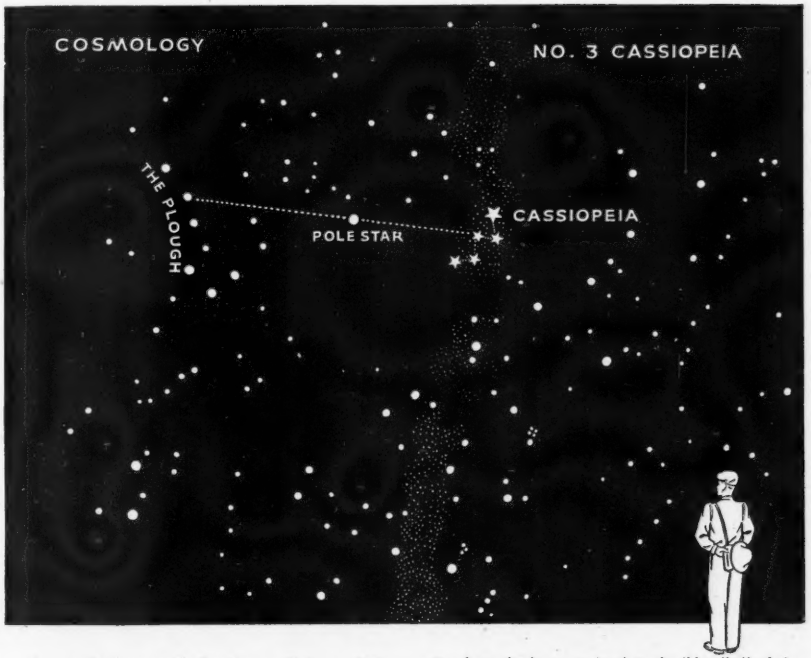

Among the more easily found constellations which revolve around the Pole Star in the northern sky, without ever passing below the horizon, is the group of stars known as "Cassiopeia," which is in the form of a letter W or M (according to which way up you look at it).

Cassiopeia is almost as conspicuous as our old friend the Plough (previously described) and lies about the same distance from the Pole Star but on the opposite side. Draw a line from the hump or bend in the "handle" of the Plough through the Pole Star and on to Cassiopeia, at the other end of this diameter. It therefore "balances" the Plough as they revolve about the central Pole Star.

Forming a background to Cassiopeia is part of that mysterious irregular whitish band consisting of millions of distant suns and known as the Galaxy or Milky Way.

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Metrovick's 'light' product

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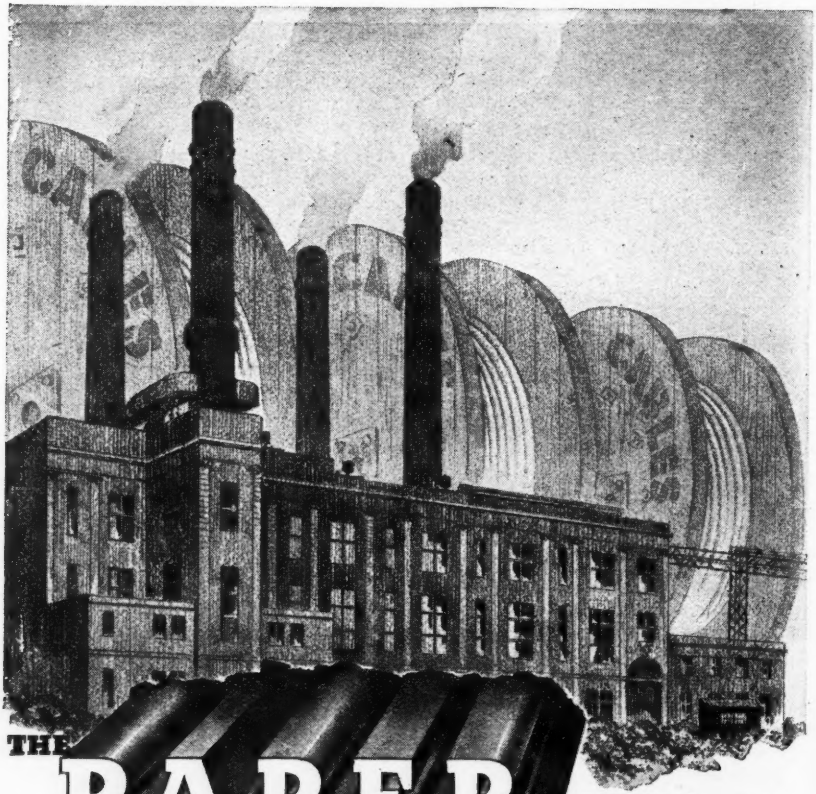

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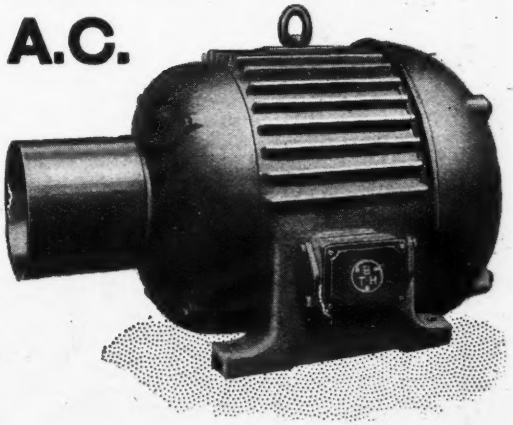
MOTORS

A.C.



For use in exposed positions or in dusty, moisture-laden, and corrosive atmospheres.

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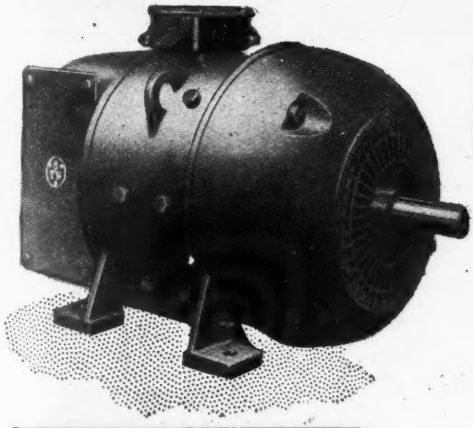

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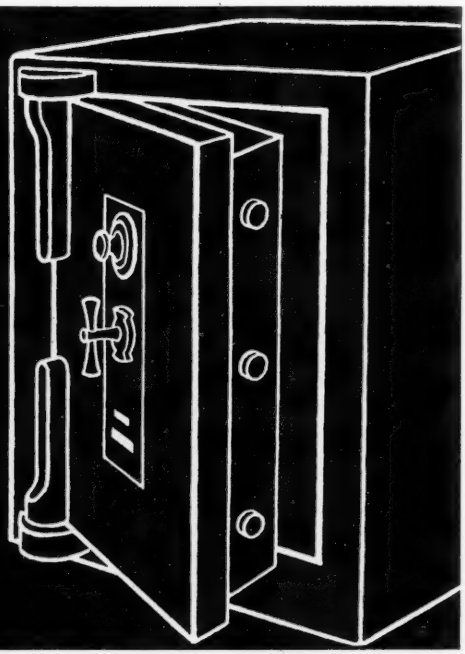

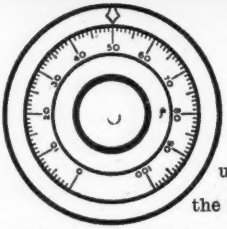

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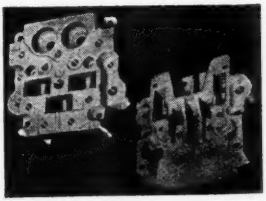

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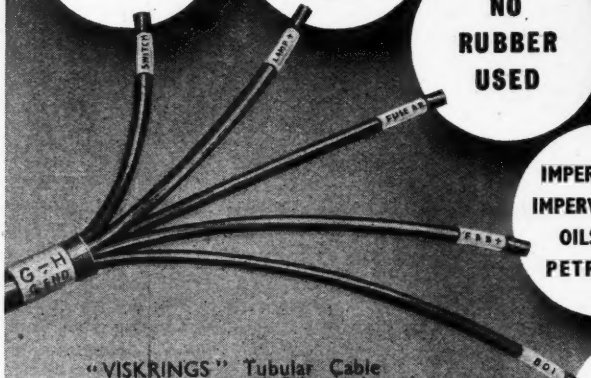

"VISKRINGS" Tubular Cable markers are simply and speedily fixed over the cable by hand—they shrink and they're tight. The simplicity of this system ensures a considerable and worth-while saving of vital man—(or woman) hours of labour.

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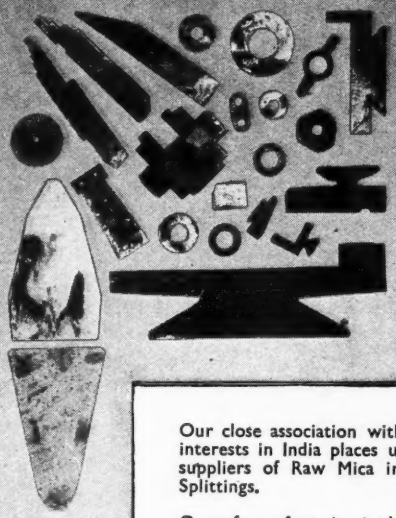

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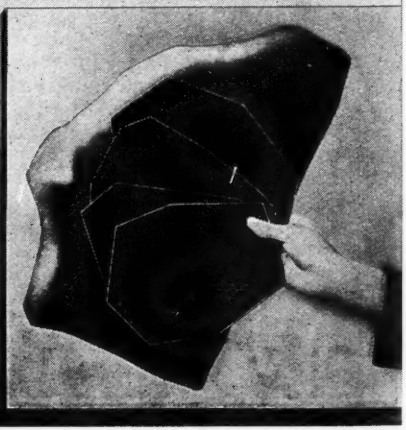

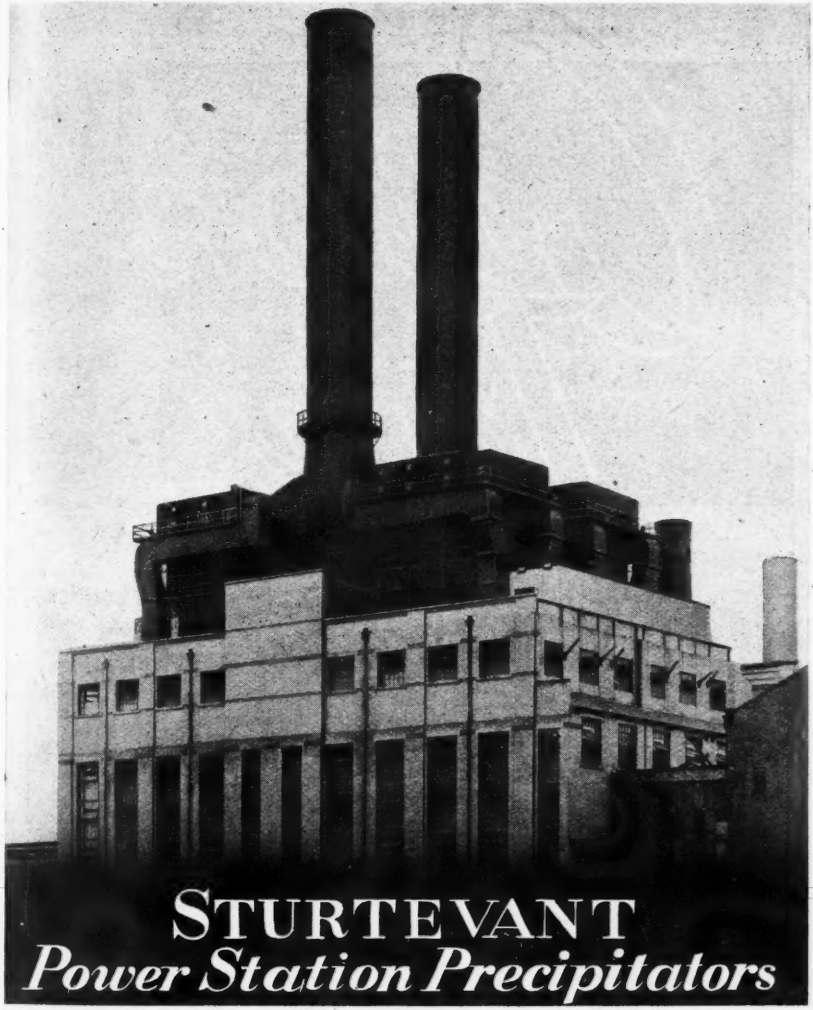

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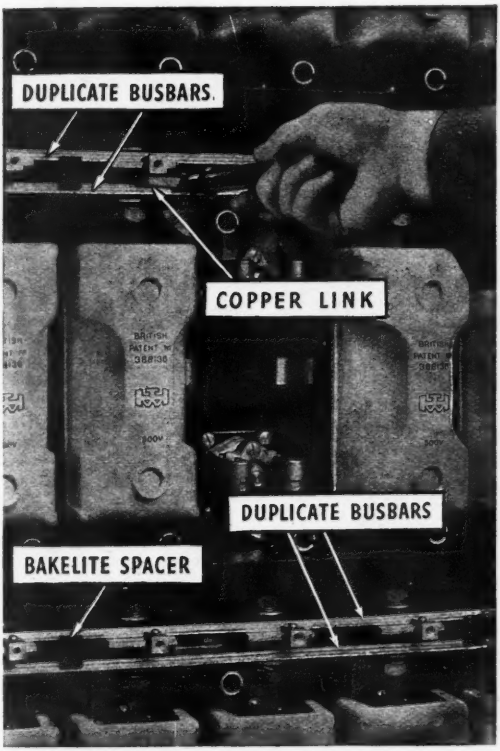

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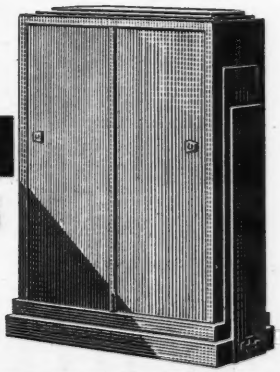

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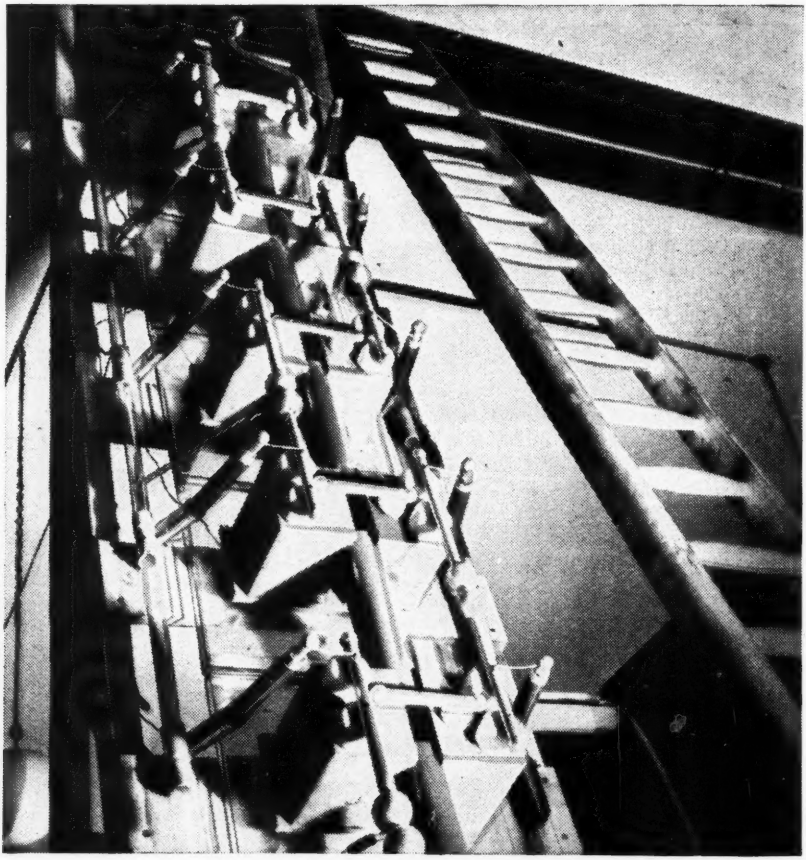

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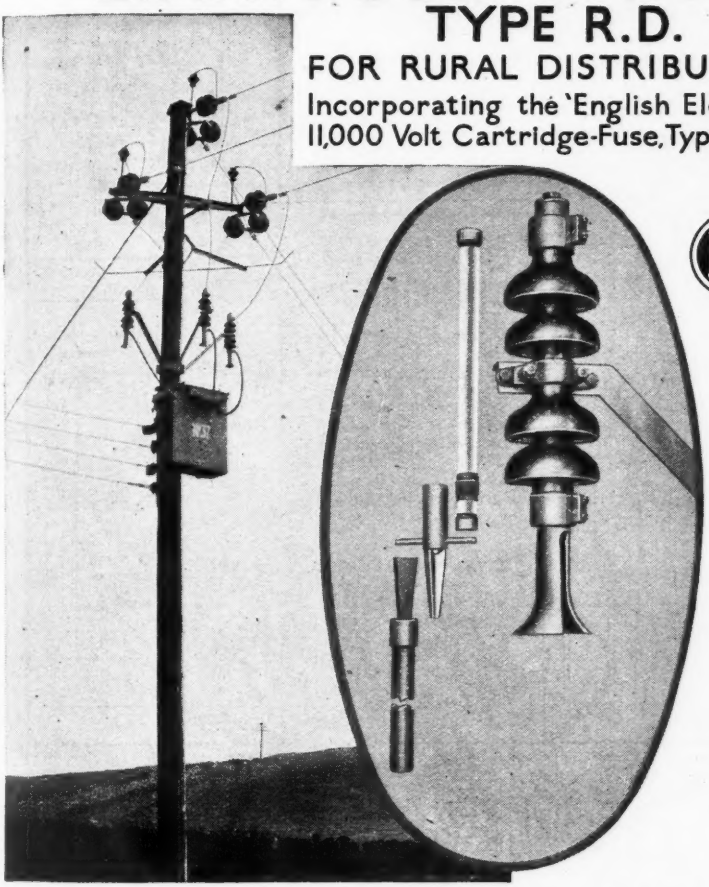

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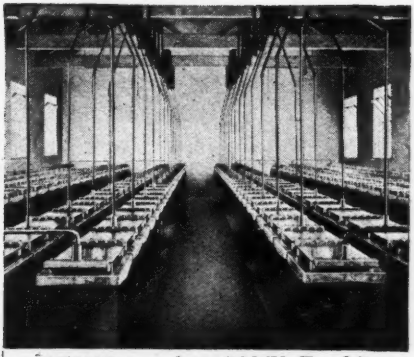

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A5/41

A1

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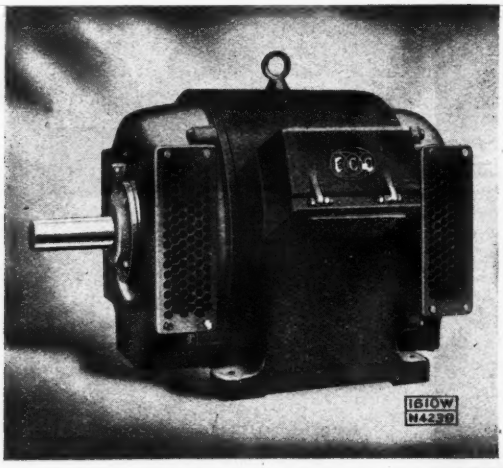

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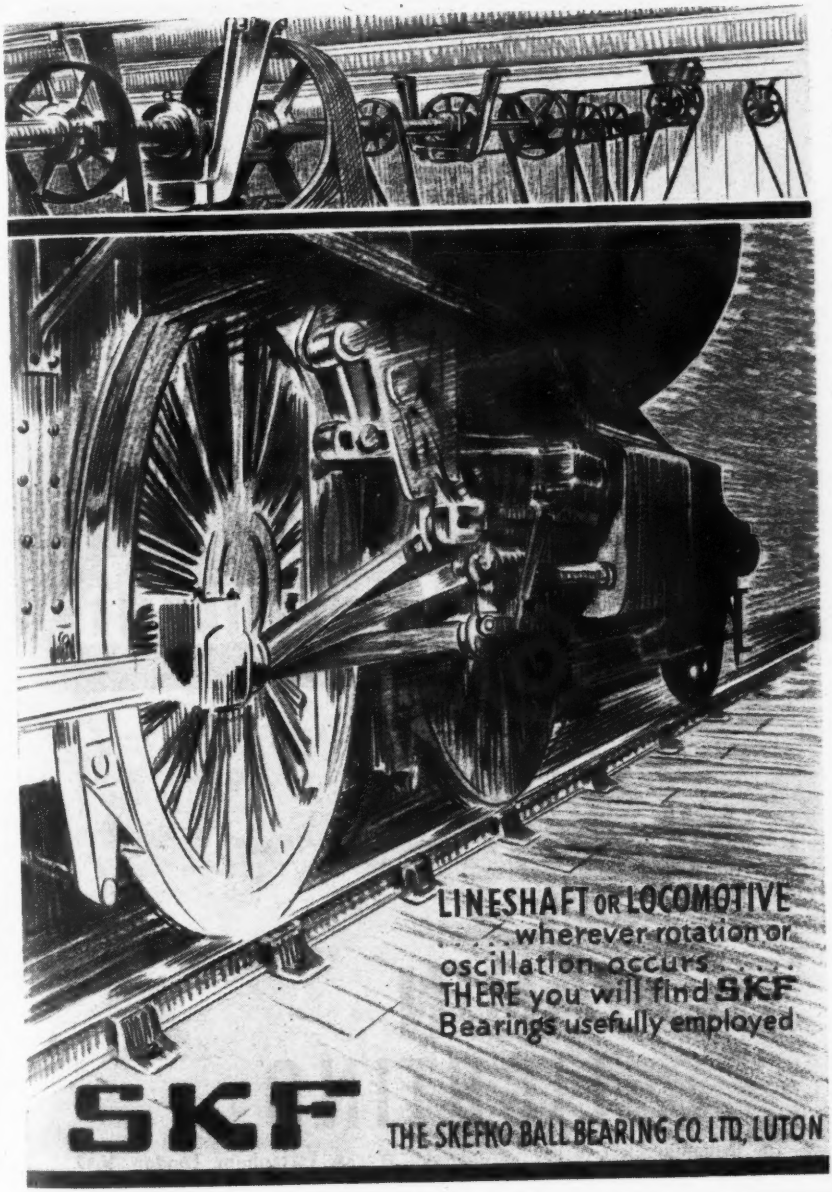
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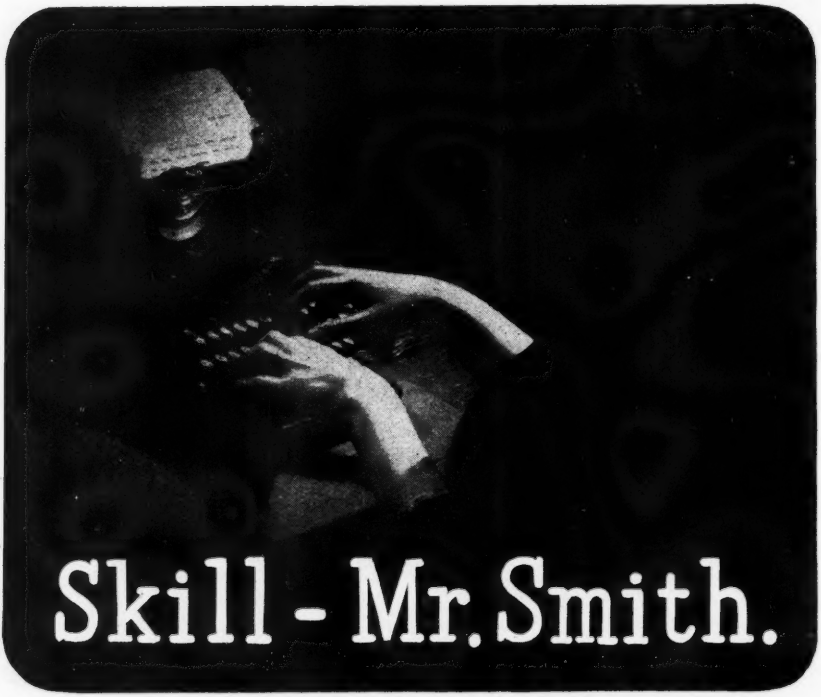

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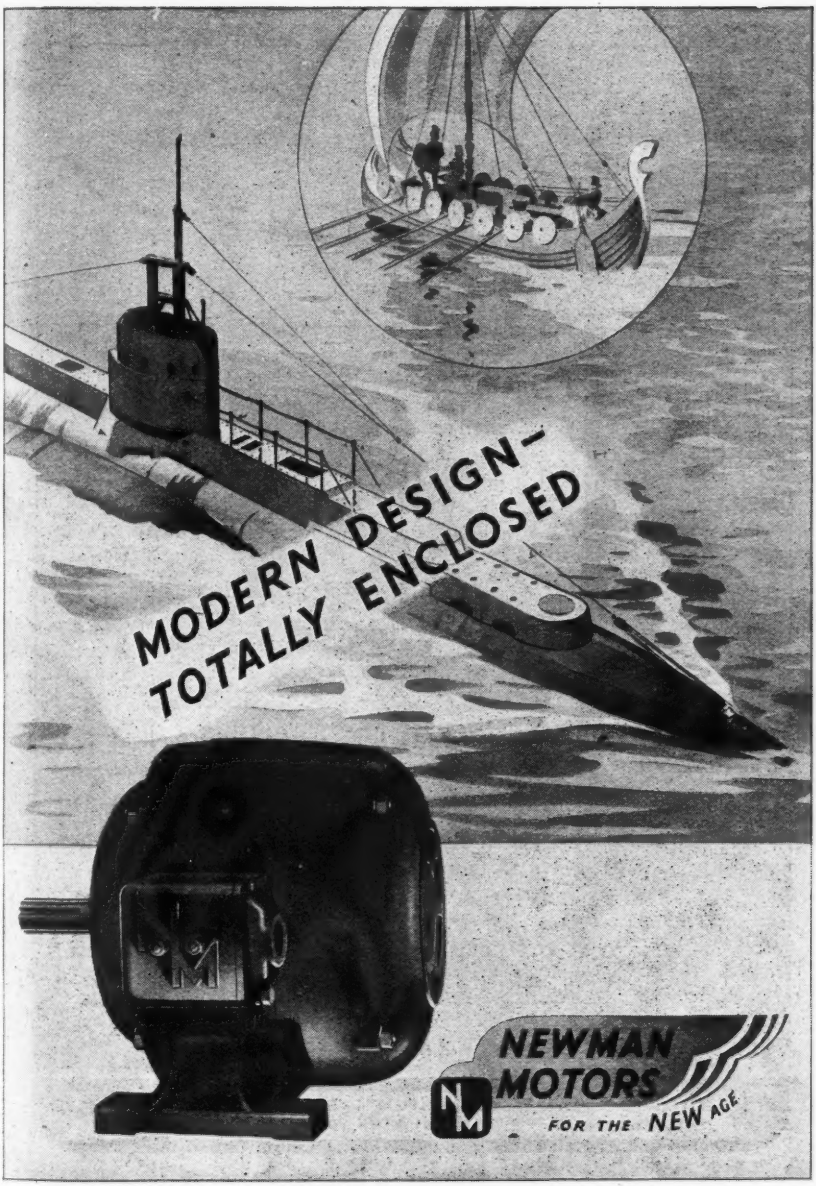

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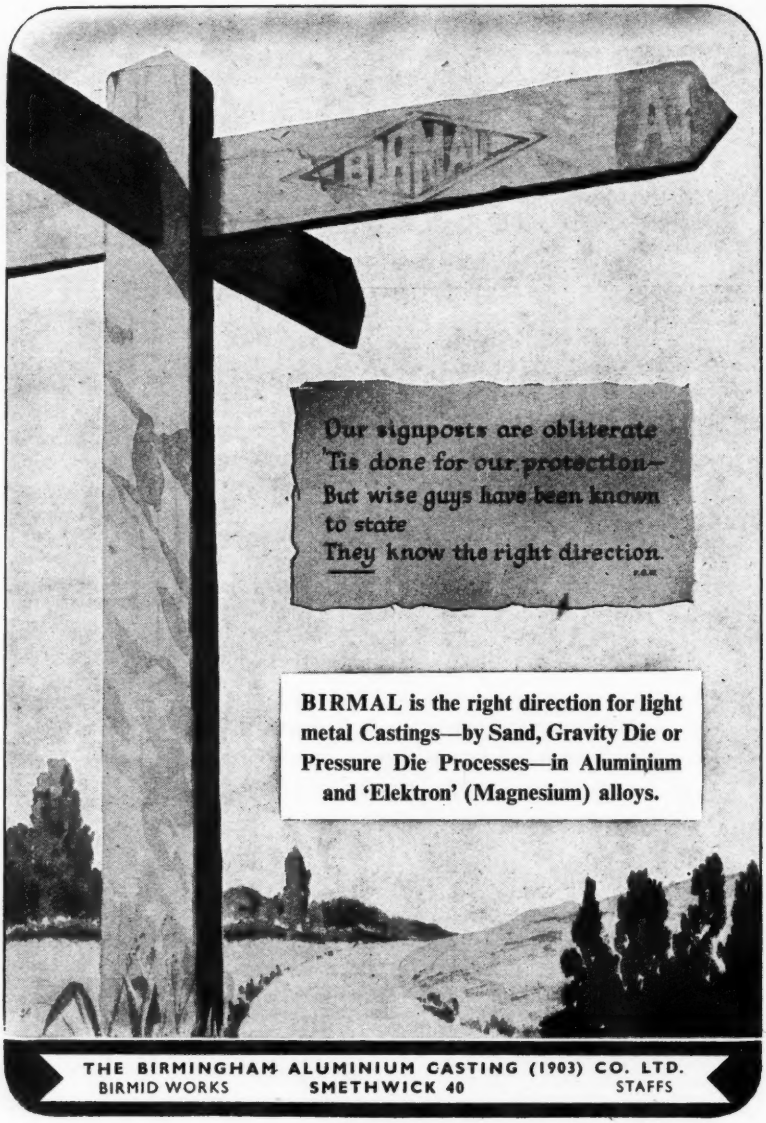
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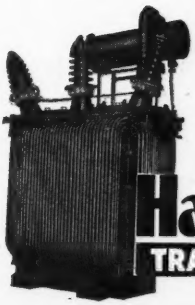

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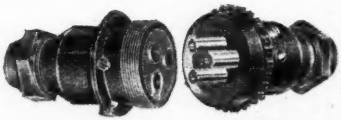

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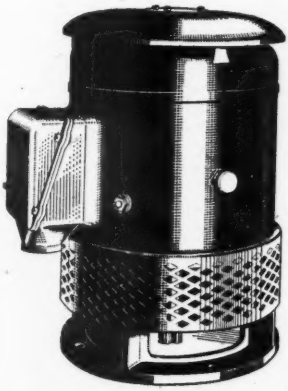

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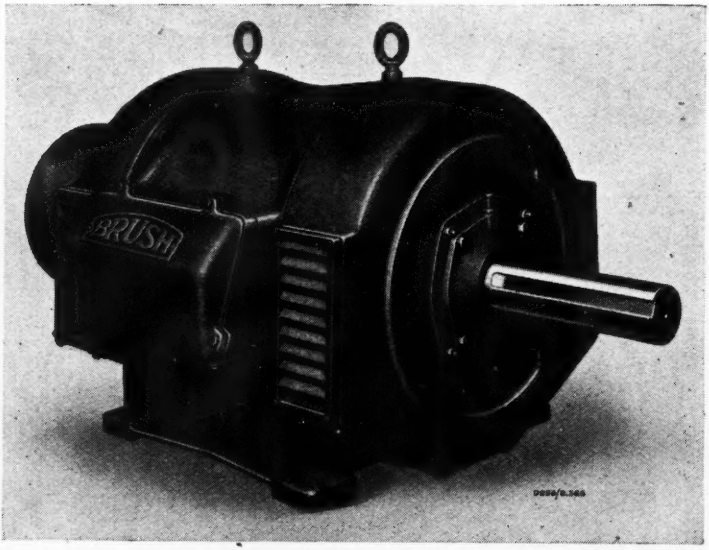

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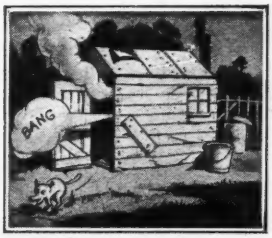
VISITS MODEL LIGHTWEIGHT POWER TOOL FACTORY. AMUSING INCIDENT WITH WORKS MANAGER AND IRON BAR.

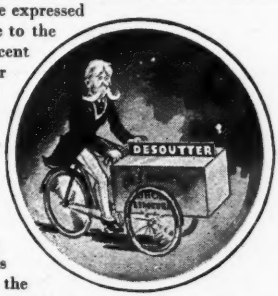


View of New Research Department.

It was our privilege a few days ago to be taken over one of the most modern and well equipped (some people would say *the* most modern and well-equipped) factories engaged in the design and manufacture of small power tools. This firm (which shall be nameless but there's no harm in guessing) is situated not a 1,000 miles from a famous aerodrome. On entering the front doors one finds oneself in a very modern reception hall with one of those staircases with no banisters, a very dinky glass case full of bits and pieces, all labelled and lit up, and a tessellated flooring (if that is how you spell it) representing a lump of epicyclic gearing. Very fascinating. There is also a very fine Sergeant who took our name and fingerprints.

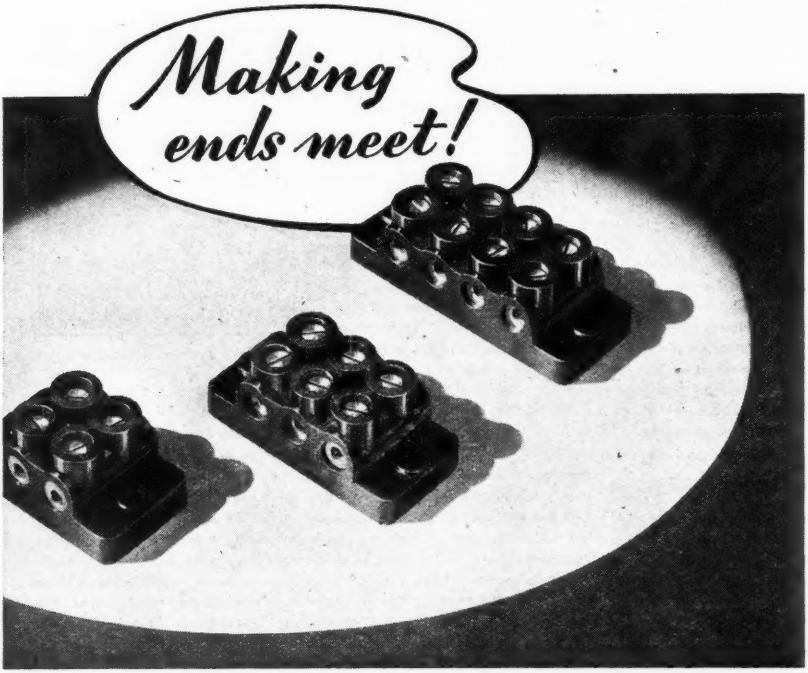
After a pleasant interlude in the Managing Director's Office (discussing the Black Market and agreeing that it was more or less drinking liquid gold) we passed into the works where a buzz of happy voices and the smell of hot tea at once assailed us. These works appeared to us to be about twelve miles long. We walked up and down a great many aisles where everyone seemed to be extremely busy doing extremely clever things with extremely complicated machines. We were informed that all these people were making what were admitted (by my informants) to be the finest small power tools in the world. Drill Guns, Screwdrivers, Nutrunners, Shears, Nibblers, Grinders, Countersinking Tools, Bolt Milling Tools and many other ingenious gadgets. It seems to us at one time that we also saw what appeared to be metal legs being bent and pushed and pulled into shape but on attempting to put a question we were seized with hiccups and decided to leave the legs alone. We were informed (and had no means of proving it false) that up to the outbreak of the present 'incident' the tools, made in this works, were in use in every aircraft factory in the country without exception. We expressed our admiring surprise at this and asked if it were due to the tools being in any way superior to other makes. This innocent question caused a regrettable scene. The Managing Director fainted and had to be revived from a black bottle; the Works Manager became deep heliotrope in colour and started to beat us about the head with an iron bar; all the machinery stopped; the workers made threatening noises and we decided to catch the next trolley-bus down the Edgware Road.

View of Managing Director. The man who first made cork legs out of metal and Portable Tools portable.



View of the prompt and efficient Delivery Service.

We should like to make it clear (in case we have to call again) that this is in all respects a model works; that the tools made therein are lighter, better and in all respects more efficient than any other small power-tools; unless the latter are advertised in this publication in which case we would prefer to express no opinion. In conclusion we would state that if ever we required a small powerful electric or pneumatic drill, or any similar power tool, we should have no hesitation in going to this famous factory — provided we knew for certain that the Works Manager was out.



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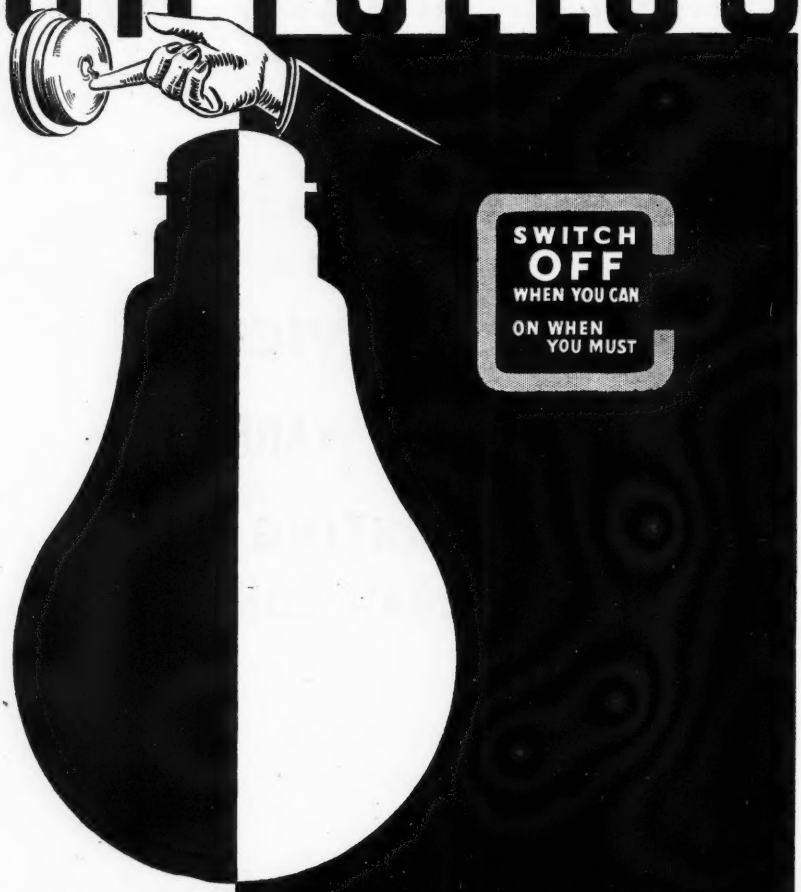

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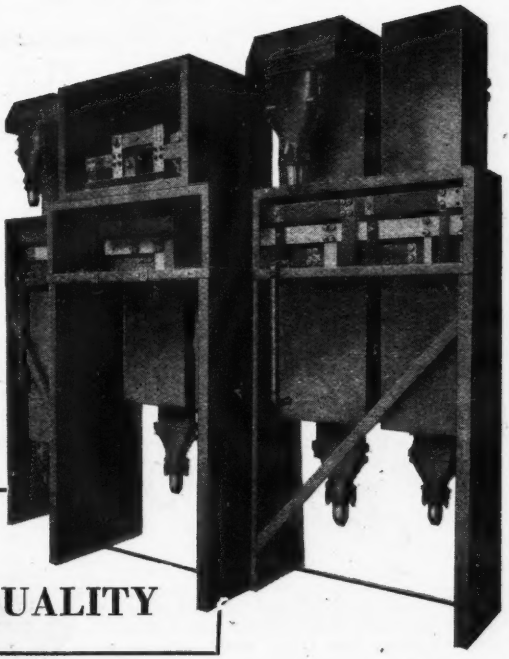

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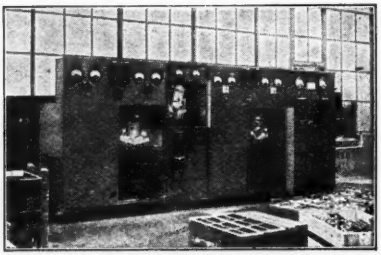

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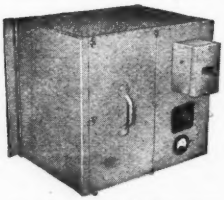

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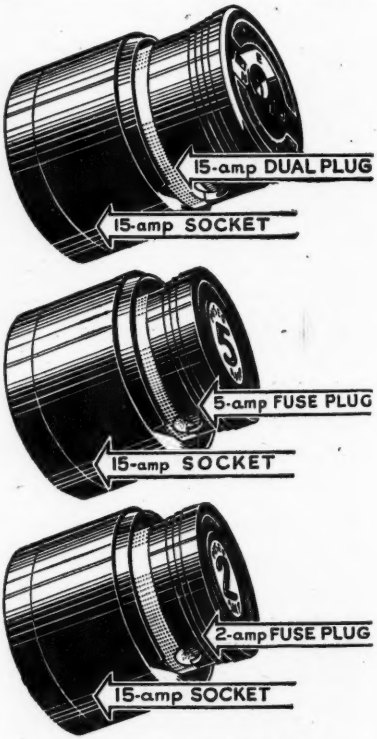

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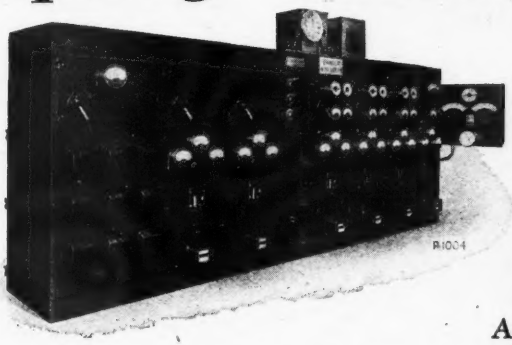

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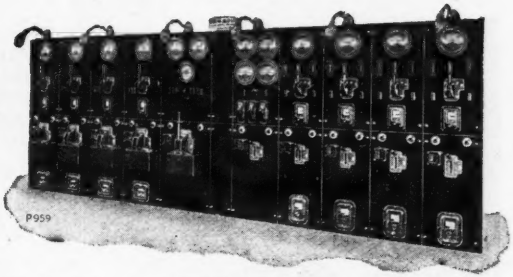

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ELECTRICAL REVIEW

Volume CXXXI — No. 3393

Friday, December 4, 1942

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ELECTRICAL REVIEW

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Vol. CXXXI. No. 3393. DECEMBER 4, 1942 6d. WEEKLY

Dual-Purpose Steam

Back-Pressure Plant Considerations

THAT appreciably more heat should be rejected to the condenser of a steam turbine than is turned into useful energy has always been a matter of concern to engineers. Of the attempts made to avoid this thermal loss, the most satisfactory has been a return to the pre-Watt era through the elimination of the condenser and the use of the exhaust steam of a turbine-driven electric generator for process work in industry.

This method has proved successful in a number of instances in which certain conditions prevail and it has yielded overall thermo-dynamic efficiencies considerably in excess of those now attainable at orthodox generating stations. Nevertheless, even where high thermo-dynamic efficiency has been achieved, that has not always meant economic efficiency, and a saving in fuel cost may be accompanied by an inordinate increase in capital, operation and maintenance charges.

Extra Treatment Plant

Some capital saving on condensing plant can be set off against the loss of condensate as pure warm boiler feed and the consequent need to install plant for the treatment of raw river water, with, may be, additions of evaporators and degassing plant should a higher boiler pressure be adopted than that needed for the " straight " generating plant suitable for a works. Account must also be taken of the complex mechanism involved and its operation.

In order that the savings made through the adoption of a back-pressure set may be commensurate with the foregoing, it is necessary that the plant load factor should approach 100 per cent., that the ratio of steam to electricity required should be greater than it generally is, and that the relationship between the incidence of the demand for the two services should be unusually close.

Seasonal Demands

It is clear that seasonal or other variations in the demand for steam or electricity are likely to be difficult to cope with, and even where a back-pressure set is used to provide process steam, it has been found best to raise any additional steam needed for such purposes as factory heating in an independent low-pressure boiler.

Each scheme then, has to be worked out in the light of individual conditions as ascertained closely beforehand, envisaging the later possibility of dislocation of balanced conditions of electricity and steam through trade fluctuations or through modifications in the manufactured products.

Looked at in the wider aspect, the weight of steam taken per kWh generated by back-pressure sets is several times that required with condensing turbo-alternators. The consequently higher cost of electricity may not always be of the first importance to those who require large amounts of process steam and who are content to regard electricity as a by-product. This point of view, however, is inadmissible in relation

to the general supply of electricity. Even if power stations could be built on commercial lines primarily to cater for unascertained demands for process steam by industries that might be attracted to an adjacent site afterwards, the needs of the many electric power consumers could not be permitted to take second place to the steam requirements of a relatively few works. Where low prices for electricity are essential for motive power and industrial heating, as they are in the vast majority of factories, the method of generation which involves loss of heat in a condenser will be unavoidable as far as can now be foreseen.

The English Electric Offer

THE acquisition of the business of D. Napier & Sons, Ltd., will represent a considerable extension of the activities of the English Electric Co., Ltd. There is no reason to doubt that the Napier shareholders will accept what is an advantageous offer; both the market value of their holdings and the income will be appreciably greater.

Instrument Standardisation

THE paper on "Standardisation as applied to Industrial Electrical Instruments," presented by Lieut.-Col. K. Edgcumbe to the Institution of Electrical Engineers is the first of several being prepared in order to provide opportunities for the expression of individual views on the subject, especially in respect of after-war needs. The B.S.I. has welcomed the I.E.E. Post-war Planning Committee's endeavour to secure such papers, and it is to be hoped that they will be incentives to discussion that may usefully guide standardisation in the near future.

Deterioration in Service

FURTHER standardisation of industrial types of electrical measuring instruments to secure interchangeability and to cheapen manufacture, is advocated by Col. Edgcumbe. There is a wealth of sound advice in his paper. He truly says that however desirable a test capable of demonstrating the "climatic" properties of an instrument may be, the number of samples necessary to ensure anything more than a fortuitous result must be impossibly large. Moreover, no test of reasonable duration will detect the causes of the slow deterioration which are the most insidiously dangerous of all. Attempts to compress life tests into a few hours have almost always failed; so the discarding of material and avoidance of unsatisfactory forms of construction is best left to the maker, whose experience based on the performance of very many instruments in all parts of the world enables him gradually to eliminate weaknesses. Manufacturers will value greatly information of any outstanding defects in instruments used by the Fighting Services. The author thinks that they have been relatively few.

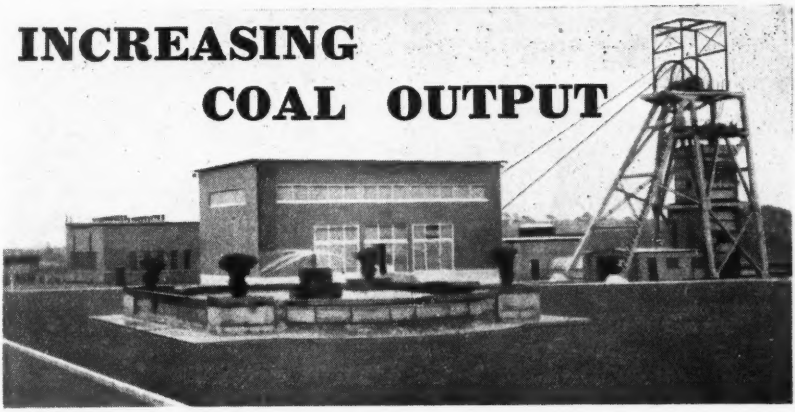
Cooker Maintenance

MOST modern houses are equipped with electric or gas cookers and have no satisfactory alternative for the preparation of meals. Consequently, if anything goes wrong with the cooker the housewife is placed in a difficult position. This stresses the importance of proper maintenance arrangements, but with the depletion of staffs and stringency of supplies repairs and replacements have become progressively more and more difficult. The London and Home Counties J.E.A., for instance, has had serious complaints from consumers whose hired cookers have fallen out of use, and the chairman of the Authority has taken up the matter with the Board of Trade. The position should, of course, be considerably eased by the standard emergency hotplate which the leading cooker manufacturers are now producing, for in most instances it is a hotplate which needs attention.

"Reviews" for the Forces

DURING the last war when paper was more plentiful we were able to send the *Electrical Review* gratis to a number of readers in the Services. This time we can only send occasional copies. There are probably many readers who would like to pass on their *Reviews* to Service men and some are no doubt already doing this; others may not know where to send them. Many electrical concerns have organisations for looking after the welfare of their absent employees and they tell us that they would be glad to have these *Reviews*. We suggest that readers who would like to pass their copies on should give us their names and addresses so that we may put them in touch with one of the welfare committees. At the same time other welfare committees who would like to receive copies for transmission to their men might let us know.

INCREASING COAL OUTPUT



Electricity's Contribution at a New Scottish Mine

A DAILY output of four tons per coal operative—four times the present national average—is expected to be attained at the new Comrie Colliery as the result of the adoption of all-electric equipment and up-to-date methods. Work on the new colliery, one of fourteen now being operated by the Fife Coal Co., was started shortly before the war, and although production has by no means reached its peak, the scheme is now beginning to get well into its stride.

At least four features render the installation of outstanding interest — its appearance, the comprehensive adoption of sequence control, the first use in this country (we understand) of dynamic braking on one of the winders, and the extensive electrically operated screening, grading and washing plant. When we heard the mine described as " like an underground railway," we must admit that we were somewhat sceptical, but actually this is no exaggeration. The elimination of the customary pit props, the substitution right up to the coal face of wide " tube-like " tunnels formed with steel girders and concrete slabs, electrically lighted, and above all the amazing cleanness and dryness of the floors do, in fact, make it difficult to realise that this is indeed a coal mine.

Planned before the war, the colliery described exemplifies what can be done by up-to-date methods to step-up output and ameliorate working conditions

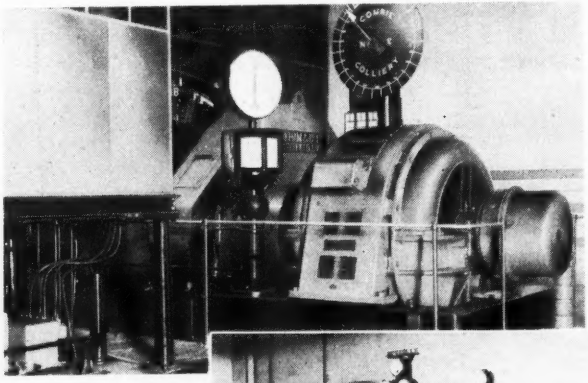
Above ground, too, except for the tell-tale pithead gear, the buildings bear little resemblance to the conventional mine erections and with a fountain in the centre and evergreens planted around, are more like a model factory estate, while to preserve the amenities of the district slag heaps are being avoided by spreading the " dirt " over a wide expanse of neighbouring land by means of an electrically operated aerial ropeway.

The ingenious system of sequence control devised covers not merely the operation of the machinery but the whole working of the colliery. By the careful design and layout of the various buildings the movements of the operatives are " canalised " from the moment they arrive until they leave. The men coming from the baths check in, pass in logical sequence to the lamp room and thence to the pit. When work is done, they go back to the surface to hand in lamps and checks, then on to the pithead baths, and on pay-day to the pay-room, and finally out to canteen, buses and home.

Following this natural sequence of processes, the first equipment of any electrical interest encountered is in the lamp room, where provision is made for eventually charging up to 2,000 lamps of the Concordia alkaline 3-cell type. To furnish the necessary DC for charging there is a 500-V, 15-HP, 110-V, 9-kW, 1,425-RPM Electric Construction Co. motor-generator set, the lamps during charging being hung on racks holding ninety-six cells each. A " Highlow " self-contained water heater (Archibald Low Electrics, Ltd.) supplies the hot water needed for cleansing cases, etc., and there are stills for the distilled water required for battery adjustment. Hailwood & Ackroyd gas testers are used.

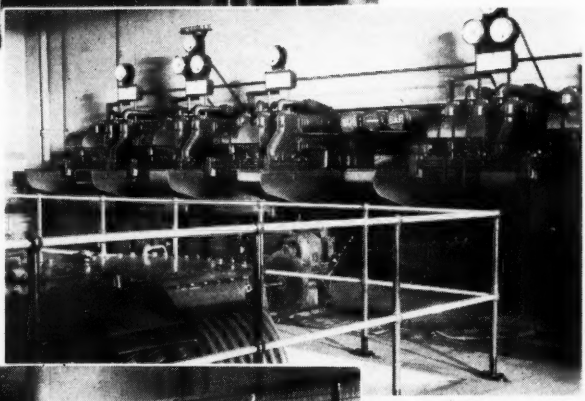
Two sets of winding gear are installed. One, the larger, for pit No. 1, is designed to handle coal only, and the other, at pit No. 2, both men and coal. Both sets are similar in design, but as the latter incorporates several features not to be found in the larger gear we

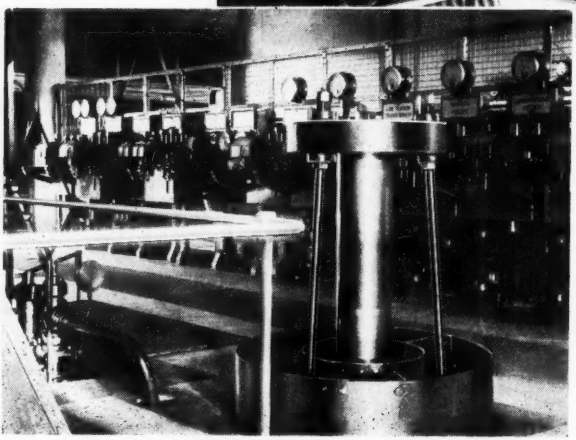
will deal with this first and in greater detail. Forty men weighing approximately three tons can be wound in one journey of the 6¼-ton, double-deck cage, which is fitted with a false bottom for sealing the airlock. The



The 600-HP, 3,000-V motor driving the man winding gear

depth of the shaft is approximately 1,250 ft., and the 560-yd.-long, 1⅝-in. diameter winding rope, which weighs 4½ tons, passes over 16-ft. diameter pulleys, erected 60 ft. from ground level, to the winder drum. This is



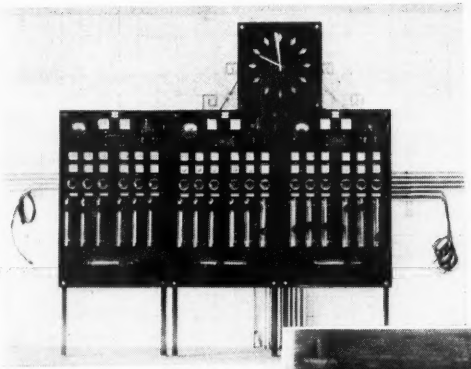


Above : The main high-voltage circuit-breakers with a portion of the 22/3-kV transformer in the foreground. Left : The low-voltage switch-gear

10 ft. in diameter and is driven at 43·2 RPM by a 600-HP (attaining 1,200 HP) 360-RPM "Metrovick" motor operated from a 3,300-V, three-phase 50-cycle supply and equipped with an oil-break reverser. The maximum speed reached is about 22 ft. per second.

Considerable reduction of wear and tear on the brake paths, which are arranged for power braking through the medium of oil pressure, is found to result from the use of supplementary dynamic DC braking. An interlock relay system automatically cuts out the AC motive power when the dynamic braking is being employed, the whole cycle of raising and lowering the cage being remarkably smooth and free from jerking. To provide the necessary DC there is a 25-kW motor-generator running at 1,465 RPM and this is equipped with a temperature re-

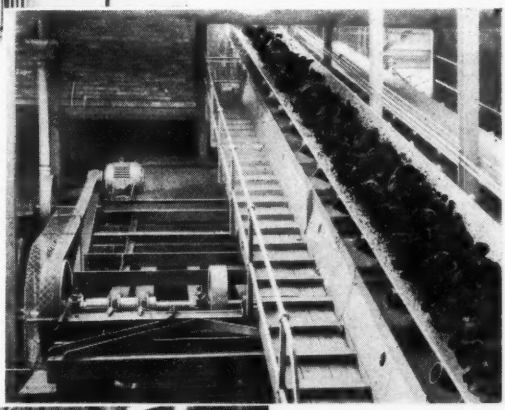
lay to guard against damage in the event of the brake being left on. The hand-operated power brake is, of course, normally in the " on " position so that if any-

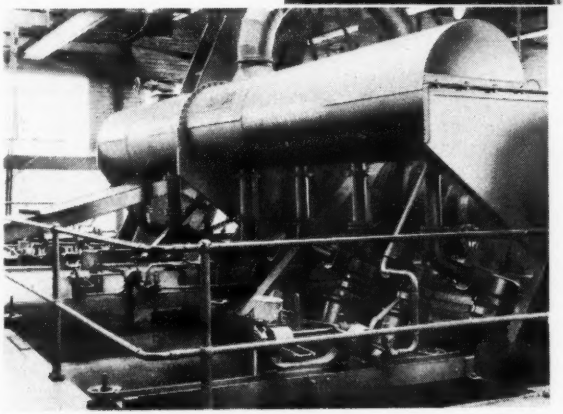


The control panel for the lamp charging apparatus, with provision made for extensions

thing goes wrong with the oil pressure the brake is automatically applied. The oil pressure is maintained by electrically operated pumps installed in duplicate, each with a 3-HP " Metrovick " motor fitted with direct-on starter. The winder is provided with a Lilly overspeed regulator with a " Duplex " governor for men and coal, and there are the usual visual and audible indicators (Automatic Telephone & Electric Co., Ltd.) for two-way communication between the winder operator, bank, and the bottom of the shaft.

Adjoining the winding room is the main electrical-control room. Energy is generated at the coal company's own power station, which serves the whole of the company's collieries and incidentally has an output as large as that of many electricity undertakings. The power is received at 22 kV through two 0·1 sq. in. copper incoming feeders and stepped down to 3 kV by means of a 4,500-kVA Bruce Peebles transformer. The six Reyrolle oil circuit-breakers employed for the incoming and outgoing supplies (two each) and the transformer, have each a rupturing capacity of 250,000 kVA. An English Electric





One of the pairs of conveyors used for the coal screening plant and (left) a portion of the coal washing plant

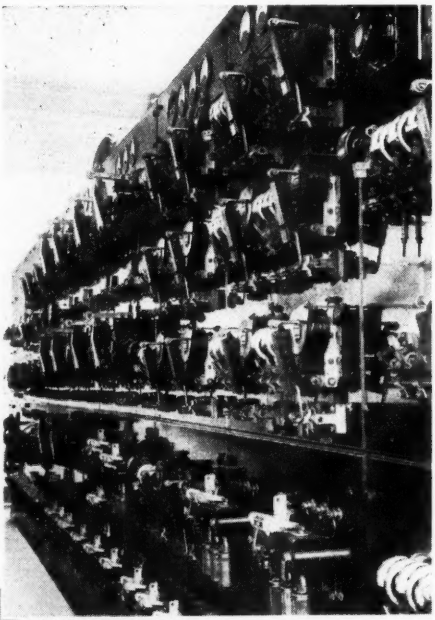
voltage regulator keeps the pressure stable, and eventually provision is to be made for a busbar coupler, so that it will be possible to keep the plant going should either of the feeders fail. Opportunities for maintenance will also be increased without interruption to the supply.

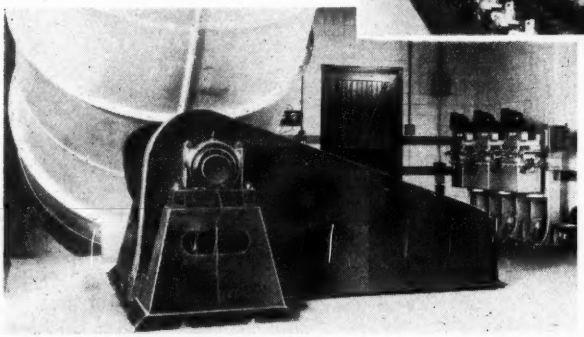
From the output side of the transformer feeders go to a bank of 100,000-kVA rupturing capacity switches controlling the

supplies to the skip winder, man winder, the screening plant and the underground equipment. At present two feeders have been installed for the underground supplies, but provision is made for a third. Situated in a room beneath the winding gear are a 15-kVA, 3,000/220-V transformer for lighting, a similar unit for low-voltage power supplies on the winder and a 250-kVA, 3,000/500-V transformer for the auxiliary services for the pithead baths, the ventilating fan drive, the compressed-air door interlock apparatus and the lamp cabin, and workshops, etc. R. M. Russell metal-clad switch-fuse gear is utilised for the lighting circuits.

As already mentioned, the No. 1 pit winder, which is designed for handling coal skips only, is considerably larger than the man winder which we have described. The 14-ft. diameter drum, a special feature of which is a clutch for rope adjustment, is revolved at a speed of 29 RPM by means of a 1,250-HP (2,500-HP maximum), 3,300-V motor running at 203 RPM. The winding pulleys are 16 ft. in diameter and weigh 6½ tons each, while both the weight of the skip and its coal capacity are 10½ tons. From the top of the shaft to the loading bunker is 1,282 ft., the average speed of the skip being between 25 and 30 ft. a second.

To obtain smooth control over the running of the motor, a liquid type rotor controller is employed in conjunction with air-break contactors and reversers. As arcing on the contactors is inclined to be very severe, especially during the low power-factor periods while sinking, it was found necessary to line the asbestos sheeting between the contacts with soapstone. The Lilly controller installed here is intended for coal winding only, men being wound only in an emergency. In addition to the hand-operated power brakes, provision is made for reverse current AC braking, the insulation of the motor being sufficiently high between phases to withstand this. Extensive skip interlocking has been arranged between the winder loading hopper in pit bottom, surface hopper and conveyors.





The whole of the screening and washing plant can be started up in sequence by means of the contactor gear above within a space of eight minutes. Left: The ventilating fan equipment

Underground the 3,000-V feeders go to the pump house, where they serve (*a*) two Mather & Platt pumps (with 300-HP, 1,500-RPM motors and Reyrolle control pillars) delivering 500 gal. a minute at 1,400 ft. head, and (*b*) a 250-kVA 3,000/500-V Johnson & Phillips transformer supplying the low-voltage apparatus. A 25-kVA, 500/110-V transformer caters for lighting. From the pump-house the high-pressure

feeders are taken to three substations, one on the north side and two on the south, at each of which is installed a specially designed 250-kVA transformer. All the flameproof switchgear, both high voltage and low voltage employed in the mine is of M. & C. Switchgear, Ltd., and Reyrolle, manufacture. To conserve room all the connection boxes are offset.

Each substation has installed for distribution purposes a bank of Reyrolle oil-break switches on the high-pressure side and M. & C. Switchgear oil-break switches on the medium-pressure system. These switches are fitted with overload and earth leakage protection, the transformers being Bruce Peebles 3,000/500-V, 250-kVA. From the medium pressure distribution are fed the Mavor & Coulson gate-end boxes feeding the coal-cutters (Anderson Boyes) and conveyors. To save coal piling the belt conveyors are remote sequence controlled from the car loading point by the attendant in charge of the loading operation. The belt conveyors which carry the coal from the face to the cars are generally each about 400–500 yd. long, and they can, of course, be linked up. Inclined against the load each conveyor requires only a single 25-HP motor to operate it.

Coal Transport

The belt conveyor discharge on to a specially designed shaker conveyor, which in turn feeds the cars, approximately 12 ft. by 4 ft., each of which hold about 3½ tons of coal. These cars are fed under the shaker conveyor by means of a chain creeper. From the loading point the cars are taken to the pit bottom by means of Hunslet Diesel locomotives fitted with 50-HP flameproof engines and a special filtering apparatus for the exhaust fumes.

In the pit bottom the cars are fed into a rotary tipper by means of a creeper, the coal being discharged into the hoppers ready for loading the skip. The cars are fitted with a specially designed coupler which does not require to be uncoupled when the tipper is revolving.

In order to avoid spillage in the screening plant all the doors of the skip are interlocked with the two plate conveyors on to which the coal is discharged above ground. The screening and washing plant, which is designed to handle 400 tons of coal an hour, comprises a continuous process of screening, re-screening, grading and washing. The run of coal is passed over preliminary screens, the coal over 6 in. being hand picked and that under 6 in. washed in two units, each unit being capable of dealing with 200 tons per hour. Belt conveyors are employed throughout the plant for handling coal and waste. Together with the pumping plant there is, in fact, a total of over 600 HP of electric motors employed in the screening plant, the units ranging from 7½ HP for the initial apron feed to 100 HP for the water circulating pump of the washing plant. All this plant can be started up in its proper sequence by a single initial operation within a space of eight minutes. The elaborate switchgear and contactor panel employed was constructed by the Metropolitan-Vickers Electrical Co., Ltd. It is, of course, possible to cut out of sequence any piece of apparatus for examination, test or repair if the necessity arose.

Conditions in the mine may be said to be as good as modern science can make them. Apart from the cleanliness and dryness resulting from the steel and concrete construction, and the efficient pumping plant, the atmosphere is kept fresh and at a comfortable temperature, as well as safe, by an exceptionally well planned ventilating system. The 105-in. diameter "Thermo-tank" fan employed will deliver 250,000 cu. ft. of air per minute against a 4½ in. water gauge. The 50-HP, 500-V, 735-RPM Bruce Peebles motor at present driving it through V-belts is equipped with an Allen West starter and Reyrolle reversing gear. The fan bearings are thermostatically controlled. A small compressor provides for the airlock on the man winding shaft, the skip winding shaft normally acting as the air return to the surface.

We should like to thank the company for granting us permission to visit the mine and prepare this article, and also Mr. Wm. Neillands, the company's chief electrical engineer, for his assistance in supplying the technical information.

Load-levelling Suggestion

IN a letter to large consumers of electricity in the area the North-West Regional Production Board refers to the effect of the steady increase in manufacturing production on the margin of capacity of power stations at peak periods. It is pointed out that firms can ease the situation by transferring a substantial part of their load to the afternoon and night shifts, thus increasing the margin of plant capacity with a consequent improvement in reliability and increased fuel economy. A rearrangement of the times during which certain processes are carried out would, it is believed, have an appreciable effect in this direction. According to the *Manchester Guardian*, Mr. R. Barlow, secretary of the Production Board, stated that while a danger point had not been reached, the Electricity Commissioners and the Ministry of Production must look ahead since the rise in manufacturing output was bound to increase the risks unless something was done to level the demand curve. Since the letter had been sent out there had been many encouraging responses and it was hoped that there would follow a still more marked levelling of the load. He added that householders could also help by careful and sparing use of electricity in the mornings.

Railway Electrification

A Ten-Year Plan?

By G. O. McLean, M.Eng.

IN his presidential address to the Institution of Electrical Engineers Professor C. L. Fortescue referred to the value of railway electrification as a post-war " public work." Though electrical engineers do not need conversion to the idea or to be reminded of the enormous advantages to the country of electric traction—the Weir Committee Report of 1931 gave convincing enough proof—many perhaps do not realise the vastness of the task involved or the effect on their own industry, manufacturing and supply.

First of all, the amount of money that would be required, or the amount of subsidising that would be necessary, or the increase in freight and passenger rates chargeable (depending on the decision regarding means of paying for electrification) can be arrived at in the following way.

In view of present-day achievements in rapid construction the author believes that a ten-year scheme may be feasible after the war instead of the twenty years suggested in the Weir Report

The peacetime traffic for an average year of all the railways in Great Britain was known to be (in round figures) 100,000 million ton-miles or 500 million train-miles (mean of 1929 figures used in the Weir Report and 1934 figures). Though local topography and the system adopted affect electrification costs per mile of track, when capital costs have been reduced to a " per train-mile " basis, practically all the schemes carried through by British manufacturers worked out at 2d. to 4d. per train mile, assuming 4 per cent. interest. Post-war labour and material costs will presumably be higher, and so an average figure of 6d. per train mile would be a reasonable assumption. After the astronomical figures of war finance, the raising of £300 odd million should present little difficulty, especially when the Weir Committee estimated that the return on this conversion capital* would be 6·7 per cent.

The Institution president envisaged the work lasting twenty years, which was the figure used in the Weir Report. But might it not be too slow for the public, who will *demand* the higher speeds for passengers and freight obtainable with electric traction, as well as its comfort and cleanliness? The track and supply equipment could be provided in a relatively short time, as the wire-drawers and cable manufacturers have ample capacity.

The locomotives and multiple-coach units required could be manufactured (in 1931) at the rate of 750 a year, using the Weir Committee's figures of 10,000 locomotives and 5,000 multiple units in twenty years, but surely in these record-breaking days of a 10,000-ton ship in less than ten days and 50,000 giant planes a year, that production figure could be at least doubled, which would involve a ten-year plan.

On the supply side, using the traffic basis of 100,000 million ton-miles and an average consumption of 50 Wh per ton-mile, an annual consumption of 5,000 million kWh is obtained. A load factor of 50 per cent. would mean an additional gross demand on the grid of 1,150 MW. Allowing for some diversity with existing load the maximum demand would be 1,000 MW. Ten 100-MW generating stations could be built and equipped in far less than the ten years, probably in about three years. The cost for the C.E.B.'s portion of electrification capital was placed at £80 million by the Weir Committee. On the 1,000-MW figure expenditure on generation should not exceed £20 per kW and on distribution (including conversion to DC at 1,500 V), a further £30 to £40 per kW, giving a total of £60 million.

The Weir Committee used the rough rule of £1,000,000 capital giving employment to 4,000 men for a year. Allowing for higher wages in the post-war period by 25 per cent., thus reducing the man-years to 3,000, then the total capital of £360 million would mean the absorption of 108,000 men for ten years.

* The Weir Committee's figure was £261 million for 114,000 million ton-miles.

A Message to Mining Engineers

MR. J. V. Harris, secretary of the South Wales Branch, Association of Mining Electrical and Mechanical Engineers, is preparing a booklet of information for the use of branch members, and has received a message from the Minister of Fuel and Power for inclusion in the booklet. In this Major G. Lloyd George urges mining engineers to strive for the maximum output and most economical use of fuel and power. He says that he relies on mining engineers to do their part in securing the increase in coal that is urgently needed, and asks those concerned with electricity generation to devote special attention to raising the standards of efficiency. By eliminating any waste, mining engineers will make a most important contribution to the war effort.

Circuit-Breaker Castings

An Alloy of High Strength and Conductivity

By Dr. L. B. Hunt, A.R.C.S., M.Sc.

THE castings which form part of the current-carrying structure of circuit-breakers have to fulfil an unusually arduous duty. In addition to the purely mechanical stresses and shocks arising during operation, such components have to withstand considerable electro-magnetic forces and at the same time to be capable of carrying heavy short-circuit currents without over-heating.

These conditions become most severe in the contact carriers or cross-bars in double-break gear for use on medium voltages, but are important throughout the contact arrangements of the whole range of circuit-breakers in view of the demand for restricting overall dimensions to the minimum, and also for lightness of moving parts to obtain maximum speed of interruption.

In the selection of material for components of this type the designer formerly had to choose between a high-conductivity copper casting or one of bronze or gunmetal. The shortcomings of both these materials are obvious in terms of the operating conditions outlined by comparison with improved alloys which combine high electrical conductivity with high mechanical strength.

"Mallory 3," a heat-treated chromium-copper alloy produced by Mallory Metallurgical Products, Ltd., is not only as conductive as normal high-conductivity copper castings, but actually exceeds the bronzes and gunmetals in mechanical strength, possessing tensile and elastic properties comparable with those of steel.

Fig. 1.—A group of circuit-breaker parts cast in "Mallory 3"

A group of circuit-breaker parts of this material is shown in fig. 1.

These castings possess unusually high limits of proportionality and proof stress, and may consequently be used in applications involving considerable stresses. With copper castings of about the same conductivity these properties are negligibly low, and are not increased by additions of cadmium, boron,

A COMPARISON OF PROPERTIES

	"Mallory 3"	High-conductivity copper	Admiralty gunmetal
Ultimate tensile stress, tons per sq. in. ..	22	10	18
0·1 per cent. proof stress, tons per sq. in.	15	2	9
Limit of proportionality, tons per sq. in.	12	1	7
Elongation, per cent.	20	30	20
Brinell hardness ..	110	40	65
Electrical conductivity, per cent. I.A.C.S.	80	80	10

or other elements which have sometimes been recommended. The use of high-conductivity copper castings for stressed parts therefore

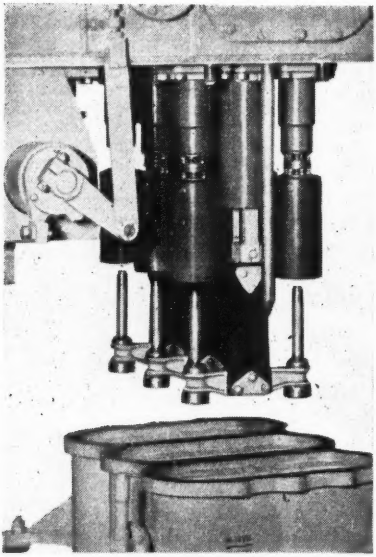


Fig. 2.—The contact structure of a new G.E.C. 33-kV low-oil-content circuit-breaker, employing " Mallory 3 " contact cross-bars

necessitates an unduly massive section, the allowable stresses being appreciably less than one ton per square inch.

In the case of the usual brasses and bronzes much better mechanical properties are naturally obtainable than with copper, but current-carrying capacity will be very much smaller and, again, an increase of section will be necessary to deal with short-circuit currents even momentarily without overheating or distortion. The relatively low electrical conductivities of the bronzes are not always as well recognised as perhaps they should be, so that sometimes in the design of a new breaker the current-carrying capacity of a bronze component is considerably overestimated.

Admiralty gunmetal, probably the most popular structural bronze, has only 10 per cent. of the conductivity of standard copper, while the so-called " electrical bronzes " have conductivities very little if any higher. Brass and manganese bronze castings may reach 20 per cent. conductivity, while aluminium bronze will not normally exceed 15 per cent.*

* Full data on the electrical and mechanical properties of these materials will be found in the publications of the Copper Development Association, particularly in " Copper Alloys in Engineering," C.D.A. Publication No. 32.

It will be apparent, then, that an alloy combining an elastic limit of some 12 tons per sq. in. with an electrical conductivity of over 80 per cent. presents many possibilities in circuit-breaker design and construction. The tendency is towards much more accurate stressing of the mechanism, which has to withstand considerable electromagnetic forces and yet to be suitable for assembly in steel enclosures of minimum overall dimensions, and minimum weight of moving parts. In a new G.E.C. 33-kV low-oil-content metal-clad circuit-breaker (fig. 2) employing " Mallory 3 " cross-bar castings to reduce the size of the contact structure for this rating, as these dimensions govern those of the whole equipment. Also a high-rupturing-capacity internal isolation type circuit-breaker by Switchgear and Cowans, Ltd. (fig. 3) employs alloy cross-bars in

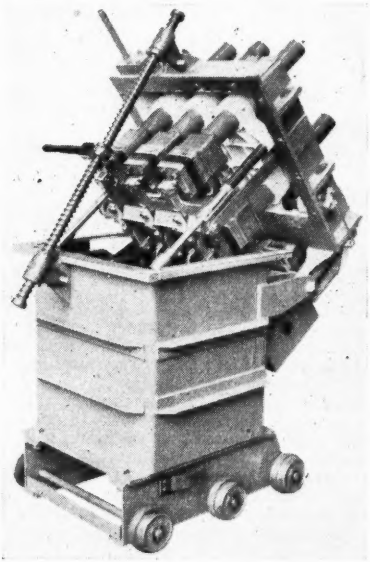


Fig. 3.—An internal isolation type circuit-breaker by Switchgear and Cowans, fitted with cast " Mallory 3 " cross-bars

order to achieve economy of section and lightness for high speed of opening—with an adequate reserve of strength.

In other recent designs advantage has been taken of the properties of these alloys to replace a wrought section of hard-drawn copper by a casting, thus enabling the designer to distribute his metal more logically to cope with the stresses involved and yet to reduce weight. Again, it has been found possible to incorporate in one " Mallory 3 "

casting such parts as brackets and strengthening bars previously made of steel and bolted to a contact carrier fabricated from wrought copper, with a consequent simplification of design and assembly.

Radiographic Examination of Castings

The employment of a cast alloy of this type for highly stressed parts has imposed the necessity for very careful control upon the manufacturer to ensure the soundness of his castings. Therefore, a radiographic method has been developed for the dual purpose of studying the foundry technique required for such a special alloy and of checking castings for soundness by a non-destructive method.

In the case of copper alloys, X-rays are of little value, as their penetration is not sufficient to disclose defects or to give adequate contrast. It has been found, however, that the gamma rays emitted by a small source of radium are much more suited to the examination of this type of material. Gamma rays are equivalent to X-rays of very short wavelength and correspondingly great penetrating power. They are, moreover, emitted from the source in all directions, and a number of castings may be arranged round the source and radiographed simultaneously. This provides an excellent means of examination, not only for non-destructive testing purposes, but also as a production tool in arriving at the most suitable method of producing a difficult casting.

The radiograph in fig. 4 is of the G.E.C. cross-bar casting shown in the left-hand bottom corner of fig. 1 and shown assembled in fig. 2, and is a good example of the photographic contrast obtainable on different sections by this method. Fig. 5 is a radiograph of another casting forming part of the arc suppression device and main contact support of a Crompton Parkinson circuit-breaker. This casting may be readily identified in the group shown in fig. 1.

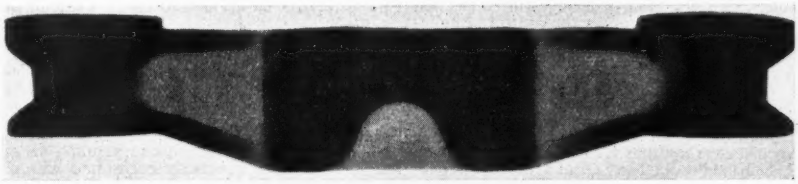


Fig. 4.—Gamma radiograph of the G.E.C. cross-bar casting shown in fig. 2

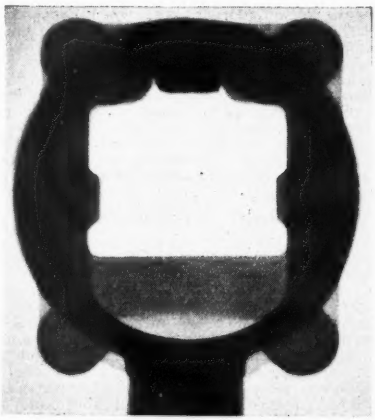


Fig. 5.—Gamma radiograph of a "Mallory 3" casting forming part of the arc suppression device and main contact support of a Crompton Parkinson circuit-breaker

Scottish Water Power

OUR Scottish correspondent says it is understood that the Secretary of State for Scotland is to publish the Cooper Report on post-war development of water power very soon. Among the recommendations, it is reported, is one that it should be left to the Grampian Electricity Co. and other companies to develop schemes for the generation of electricity. The Report, it is believed, will not favour the State taking such development in hand. Local authorities are to have special rights where the water power is concerned.

In a memorandum to the Secretary of State for Scotland, Sir Murdoch MacDonald, M.P. for Inverness, pleads for hydro-electric development. He makes the following proposals :—The Secretary for Scotland can be asked to present a Bill to Parliament by those desirous of carrying out any particular scheme for the purpose of erecting and operating manufacturing plants within the Highland area. Before the Secretary gives approval he should ask the opinion of the county, city, and burgh councils in the area. He proposes that the Grampian Company, which has rights for seventy-five years in a great part of the Highlands, should be reorganised and made a vehicle of further development. The cost of passing a Bill through Parliament, of which the Secretary of State approves, should be borne by the State.

The Secretary of State for Scotland conferred on November 20th with representatives of the Convention of Royal Burghs on post-war developments. It is understood the report of Lord Cooper's Committee on hydro-electric development was under consideration.

Contractors' Memoranda

Effects of Essential Work Order

A VARIETY of matters in which electricity contractors are interested have formed the subject of recent letters to members of the Electrical Contractors' Association by the Director, Mr. L. C. Penwill. Among other things he draws their attention to the new Standard Specification for adhesive insulating tape, the notification of changes in connection with firms registered under the control of building and civil engineering arrangements, and the operation of the Liabilities (Wartime Adjustment) Act, 1941.

With regard to the last it is pointed out that the Court can deal with such matters as rents, mortgages, hire-purchase agreements and other liabilities, adjusting them in an applicant's favour when he can show that he is seriously embarrassed by such liabilities. The Court has power not only to adjust liabilities, but also to postpone payment of them, and in particular to postpone the realisation of property temporarily depreciated in value. The Act also empowers the Court to deal with future liabilities which may turn the scales against the trader.

For detailed information regarding the Act and assistance members of the E.C.A. are referred to the local Liabilities Adjustment Officer (whose address can be obtained from a County Court) or the Board of Trade, Industries and Manufactures Dept., Millbank, London, S.W.1.

Cable Drums

Many appeals have been made during the past two years for the immediate return of cable drums to the makers. Some members say that they have experienced difficulty in having drums collected. They are advised to notify the particular maker concerned ; the Cable Makers' Association has given an assurance that all possible steps will be taken by the cable makers, individually or collectively, to do what is necessary.

Essential Work Registration

So far only a small minority of the members of the Association have been scheduled under the Essential Work (Electrical Contracting Industry) Order. Members carrying out work for a Government Department directly are advised to apply to the representative of the Department, preferably the S.O. or resident engineer, on the site. Those who are sub-contractors for Government work should apply through the main contractors to the Department concerned. Members who are not engaged upon direct Government work, but whose activities are confined to industrial and other establishments, should represent to their customers the desirability of their being scheduled under the Order and suggest that the customers should approach the Department for whom they are in production with a view to having the contractors scheduled.

The E.C.A. has made arrangements by which a scheduled contractor may make a claim in respect of an existing contract for any extra cost in which he may be involved by observing the conditions of the Order. As regards future contracts (subject to cost variation) a clause has been devised under the terms of which the contractor will be deemed to have made provision for all costs save that of the guaranteed minimum period. The net proved cost of this will be repaid to the contractor. This will not apply in the case of future fixed-price contracts where the price will be deemed to cover all resulting costs.

Plant Available

Mr. Penwill has referred again to the schedule received from the Ministry of Works and Planning of electrical and other plant which is available for use. He suggests that members shall notify him of their requirements when he will examine the lists to see whether their needs can be met. He quotes further examples from the lists, including motors ranging from 0·5 to 90 HP, AC and DC, engines and generating sets (150 and 250 kW).

Week-end Work

Adverting to a recent notification regarding week-end working, Mr. Penwill says that the Ministry of Works and Planning has now announced that to meet the position of operatives working away from home it has been decided that the mid-day cessation can be either on the Saturday preceding the specified Sunday or on the Saturday after, but not on both. The Saturday selected is to be arranged on the site between employers and operatives, and on Saturdays not so selected a full day of eight hours should be worked.

Young Persons' Hours

The Building and Engineering Construction (Young Persons) Order, 1942, which applies to electrical contracting operatives, fixes the maximum weekly working hours of young persons under 16 at 48 and those of young persons of 16 and 17 at 54. Moreover, young persons under 18 may not be employed continuously for more than five hours without a rest or meal interval of at least half an hour or on Sundays unless a whole holiday is given in the preceding or following week. Employers are required to keep records of the working hours of young persons.

Review of Deferments

Attention is drawn to the Ministry of Labour's decision to review deferments of men in a wide range of occupations, particularly of those under 30 years of age. The occupations include electrician, wireman (vehicle and aircraft) ; overhead linesman (not tramway or trolley-bus), overhead wireman (railway, tramway and trolley-bus) ; cable layer, service layer ; tester ; telephone, telegraph fitter, mechanic ; conduit railman ; electrician's, overhead linesman's, wireman's mate or labourer ; and cable jointer's mate.

The Ministry has given an assurance that where men cannot be released without substitution their deferment will not be cancelled until a substitute is available.

Electrical Instruments

Scope for Further Standardisation

HOW, and to what extent, industrial types of electrical measuring instruments (other than integrating meters) might be further standardised is described by Lieutenant-Colonel K. Edgcumbe (Everett, Edgcumbe & Co., Ltd.) in a paper submitted to the Institution of Electrical Engineers in London.

The paper commences with a comparison of the more important specifications of the British Standards Institution with the corresponding provisions of the American Standards Association, the Verband Deutscher Elektrotechniker and the International Electrotechnical Commission. For determining those relationships standardisation is classified into three groups ; its first object is to secure limits of performance, the most important aspect of which is the prescribing of different permissible errors for sub-standard and first-grade instruments according to type of movement.

One of the terms of reference of the I.E.E. Post-war Planning Committee is to consider and report on problems of standardisation of materials and design. Lieut.-Col. Edgcumbe's paper, dealing with industrial electrical instruments, provides an important contribution to information on this subject

The author examines relevant specifications, particularly BS.89 (indicating instruments, 1937), clarifying certain parts and suggesting possible extension, or amendment, when revision is next contemplated. Reference is also made to BS.90 (graphic chart-recording instruments, 1940), which has recently been brought up to date, providing for much greater accuracy than hitherto. BS.81 (instrument transformers, 1936) is well in advance of similar specifications published in other countries. For the first time, regarding high voltage tests, an attempt has been made to distinguish between stresses imposed upon voltage transformers according to whether the system has a directly earthed neutral point, is normally insulated, or has one line earthed. A further direction in which the specification breaks fresh ground concerns the over-current rating of current transformers.

Flameproof Types

Although flameproof instruments are alluded to in BS.89 their construction has not yet been prescribed. Much investigation has been done by the Electrical Research Association, and the Mines Department has introduced a number of requirements into its Testing Memorandum No. 4, but neither has dealt specifically with measuring instruments, which present special difficulties, particularly with respect to the terminal box for, or other means of, connecting the instrument to the circuit in a flameproof manner.

The second object of standardisation is to imit dimensions and other attributes in order to secure interchangeability, or to cheapen manufacture by concentration upon a small variety of products for the elimination of redundant patterns. The author suggests that more might be done in these two respects, preferring the term " concentration " as being self-explanatory and less liable to confuse than the all-embracing word " rationalisation."

Interchangeability is imperative in some cases; for example, some specifications of the Fighting Services differentiate between essential and non-essential dimensions. They not only require instruments supplied by one maker to be assembled in equipment made by another, but that it must also be possible for essential spares to be " instantly dropped into place." An early instance of dimensional standardisation by the Admiralty, which enables instrument cases to accommodate the standard movement of every maker, has worked excellently. It has enabled makers to divide the cost of patterns and tools between themselves, and, at the same time, to use the movement each has developed through long experience, thus expediting delivery and minimising the cost of production.

The alternative procedure, which unfortunately is still too frequently adopted, of basing specified dimensions upon those employed by one maker for a particular type of instrument, is much to be deprecated.

Interchangeability Requirements

The author sets out a proposed basis for standardising DC shunts rated above 2,000-A, suitable for copper busbars, but apart altogether from main dimensions there are a number of other special characteristics in respect of which interchangeability is very desirable. One outstanding example (although outside the scope of this paper) is the time/current curve of protective relays. Electrical as well as mechanical interchangeability is also very desirable in some cases ; for instance, instruments forming part of the electromedical equipment of hospitals so as to minimise risk of urgently needed apparatus being long out of commission.

Both users and manufacturers will agree

that there are altogether too many different sizes and shapes of instrument cases. Changing conditions, such as the tendency to mount a small instrument near the observer rather than a larger one at a distance, are causing many designs and cast metal cases to become obsolete. At the request of B.F.A.M.A. the B.S.I. has published a list of " preferred sizes " of switchboard instruments that represents a considerable advance in the direction of concentration, four sizes being now proposed instead of fourteen hitherto listed by makers, excluding portable models.

Ammeters and Voltmeters

Based upon considerations of dial-scale division and extension, the author tabulates a proposed set of specified currents for switchboard ammeters, representing six ratings in every decade, each one being about 50 per cent. greater than that preceding it, which he believes should satisfy practically all requirements. Maximum scale values exceeding the rated currents by still greater percentages will be required for some purposes, but they must be regarded as special and outside the author's proposals. Portable and testing ammeters differ from switchboard models in that it is not often possible to foretell what they will be used for. Consequently it is recommended that their scale should be as evenly divided as possible throughout (closing up perhaps slightly towards the upper end) and that their rated current should correspond with their maximum scale value. Several alternatives are available for multi-range ammeters.

Five maximum scale values will probably suffice for portable single-range voltmeters, while for multi-range patterns an overlap of two to one is usually convenient. Much the same principles apply to wattmeters as to ammeters so far as rated current is concerned, but the choice of a maximum scale value must take power factor into account. Suggested characteristics of some portable wattmeters are tabulated by the author.

Instrument Jewels

B.S. 904 (dimensions of instrument jewels) is a distinct step forward in the direction of concentration, for over 30 sizes have been used in this country alone with cone angles ranging from 60 to 130 degrees. All that really matters is the shape of the bottom of the cone upon which the pivot point rests, the angle of the cone being of quite secondary importance.

The three sizes of instrument jewel that have been standardised are 1, or 1.25, or 2 mm. in diameter with respective cone angles of 75, or 80, or 85 degrees. The most important feature of jewel shape is the radius of curvature of the bottom of the cone. Radii of 0.04, or 0.08, or 0.12 mm. are recognised ; their reduction lessens rolling, but makes the jewel more difficult to polish.

The varieties of control springs are numberless, resulting in an altogether unnecessary cost of production and loss of output. The dimensions of the strip and number of its convolutions hardly concern the user at all, but the fact that thickness will often be less than 0.001 in. indicates difficulties experienced by the manufacturer in making a spring of a given torque. A departure of only a ten-thousandth of an inch from the nominal thickness may result in a variation of 50 per cent. in the strength of the finished spring. Instrument designers can contribute to increased production, and incidentally reduce cost, by restricting their requirements to a smaller number of torques and diameters of springs, the author's proposals in these respects being tabulated.

Finally, attention is drawn to a set of 32 symbols standardised by the I.E.C. for use on instrument dials to indicate the type of movement employed.

The great reduction in cost that is possible when a product can be manufactured more or less continuously does not result merely from spreading the overhead charges over a larger turnover, although this represents definite economy. More important are the saving of time and the improvement in quality which result from the workers being able to perform the same set of operations day after day. Incidentally, the author states that operatives much prefer what one would have thought to be a monotonous job, which they have thoroughly mastered, to the uncertainties of another which they have not. From every point of view, therefore, concentration upon the minimum number of variants is most desirable.

Swedish Water Power

DURING the last few years the production of hydraulic power has been to a large extent gradually transferred to the north of Sweden. In 1930 only 22 per cent. of the total output of power was in the province of Norrland, but in 1941 the proportion was no less than 45 per cent., owing to the rapid construction of new power stations, chiefly on the Indalsälven River. During 1941 the dominant position of the northern regions was further accentuated by the marked lack of water in central and south Sweden. In view of these circumstances the volume of power transferred from north Sweden towards the south was greater than ever before, which in its turn led to an increase in losses.

The lack of water and fuel has rendered the rationing of electric power necessary. Owing to the shortage of water, which has been more and more acutely felt in recent years, it has been impossible to increase the output of electricity in central and south Sweden, while at the same time, owing to the present fuel situation, the demand for electricity, especially for domestic purposes and the railways, has increased abnormally.

INSTITUTION PROCEEDINGS

The Engineer's Influence. Irish Power Proposals.

SOME of the ways in which railway signalling and associated means of communication are developing are outlined by Mr. A. E. Tattersall, M.I.E.E. (London and North Eastern Railway), in a paper recently presented to the INSTITUTION OF CIVIL ENGINEERS in London.

The author commences with a statement of the Ministry of Transport's requirements in respect of track circuit resistance, and illustrates some of the results of his own tests, which show how shunt resistance decreases as the applied voltage is increased. Several different means of feeding DC track circuits are described, in which connection a much needed improvement is reduction of the time required for the operating relay armatures to release (especially DC types), this period depending upon the time constant of the circuit, meaning its inductance/resistance ratio. Track circuiting cannot at present be applied successfully where either steel or concrete sleepers are employed, or on those sections of the track where engine drivers need to use sand freely to help wheel adhesion. As an alternative, there have been many trials with axle or wheel counters, but they have not been entirely satisfactory at high speeds. Tests are shortly to be made with an inductive system which it is hoped will have the desired results at all speeds.

Railway Signalling Developments

New System at York

The first complete relay interlocking installation, displacing mechanical lever frames, was brought into service in 1933 at Thirsk. An installation being completed at York will control the whole of the traffic from 1½ miles north to 4 miles south of the station. There will be 798 routes, 100 main-line colour-light signals, 170 position-light shunt signals, 300 point machines and 300 AC track circuits, together with associated auxiliary apparatus. Each of the three bays of the panel is 10 ft. in width ; immediately below it on a sloping keyboard are the switches for route setting, whenever practicable placed below the respective signal cleared by the route switch. An innovation is that the routes, when set up, will be illuminated by white pea lamps. The York interlocking installation is believed to be the largest so far constructed, replacing eight large mechanical locking frames.

The control of points and signals has become entirely a switching problem and the rotary sequence switch employed largely in certain automatic telephone systems has been admirably adapted to the purpose. It has enabled a considerable reduction to be made in the quantity of apparatus necessary, so that the attendant economies, both of plant and size of signal box, has been considerable. The equipment of two signal boxes at Doncaster is almost completed, the tender having been awarded to Standard Telephones & Cables, Ltd.

Apart from the London and North Eastern Railway nothing has been done in Great Britain in the way of circuit interlocking, excepting a few partial installations on the London, Midland and Scottish Railway, and one small one on the Southern Railway. In the United States and the British Dominions as well as in Europe the system is being extended. The extent of the area that can be controlled with a conventional power-lever frame is definitely restricted by the limitations of the frame itself and the staff required to man it, whereas as yet no such limitations apply to circuit interlocking. If the desirable combination of the traffic-control and signalling systems is to be effected it is essential to utilise something more flexible than the unsuitable power-lever frame.

Mechanical colour lights have been largely extended on some sections of railway in replacement of semaphore distant signals when renewals and alterations have been made. Fog men may thus be dispensed with and the costs of installation and subsequent upkeep are frequently no greater than those of displaced semaphores.

Automatic Control

Automatic train control in Great Britain has been concerned with the distant semaphore signal only, the term thus being a misnomer. The systems in use have given excellent service, but are better described as "two-aspect warning control systems." Paradoxical as it may seem, the ideal system is not one of control at all, but one that enables the state of the line ahead of the train to be constantly indicated in the engine cab, although the cost would be prohibitive.

Approach lighting of colour signals is now generally accepted on some sections of railway. It enables a far longer lamp life to be obtained, even taking into account the fact that the lamps may operate at full voltage, resulting in a much greater brilliancy than is possible with continuous lighting because in the latter case the lamps have to be underrun to secure a reasonable life. Since 10 per cent. reduction of rated voltage

means 30 per cent. reduction of lumen-output, the advantage accruing is real and definite. Lamps will remain efficient for several years, in strong contrast to continuously burning lamps whose life is measured in weeks.

Means of communication are an indispensable adjunct to railway operation, for the control of traffic from a central point. The advantages to be gained by the use of teleprinters are referred to, their sphere of usefulness being considerably increased by superimposing automatic switching. Creed & Co. contracted for the Liverpool Street station installation, Standard Telephones & Cables, Ltd., subcontracting for the switching equipment. The author acknowledges assistance he has received from the last-mentioned company in the cabling of signalling and communication circuits.

Post-War Economics

LORD Sempill was to give an address on "The Engineer's Attitude towards the Post-War Economic Situation," at a meeting of the INSTITUTION OF CIVIL ENGINEERS, yesterday (Thursday). Lord Sempill says that the civil engineer and all brother engineers in whatever branch of the art they may be engaged are, as a class, more busy to-day than they have been for a quarter of a century—since the last war. It is true that this condition is universal, and has been accepted with but casual comment. The civil engineer accustomed to long-term planning may, in a brief pause from the pressure of war work, look ahead to the immense programme of reconstruction to be accomplished when the orgy of destruction is halted, and may well speculate.

During the last war leaders in the political field assured us all that when peace was restored "a land fit for heroes" could be built up, and in this vision engineers saw scope for their skill in design and workmen for their craftsmanship. It is not unnatural that we should look critically at similar forecasts which are made from time to time in these days. We live in a world in which science and technology must play a part growing in importance in the affairs of government. By slow degrees, and through the instrumentality of the recently established Scientific Advisory Committee to the War Cabinet, a step is being taken in the right direction. The inexorable progress of technical development exercises a yet more potent influence.

The engineer asks why, when he could do so much to improve the conditions under which people live—houses and the equipment thereof, transport, and in fact every phase of our daily life—it is not possible to provide continuous employment for all so that the increasing flood of these amenities may be universally enjoyed. The engineer has been responsible for vast changes by the rapid development of power production, 97 per cent. of which has taken place since the beginning of this century. He realises the enormous benefits that could be provided for all to enjoy, with the world's raw materials at his command, were it not for the difficulties created by an economic system built up during the past centuries and out of phase with the world of to-day.

He has seen capital equipment destroyed and also material that peoples required. The term "over production" has been frequently used when "under consumption" would have been a more correct description; in other words, the failure of the financial system to distribute enough "licences to consume." Instead of increasing effective demand we have concentrated upon the limitation of output and the destruction of supplies. It is clear that a courageous tackling of root causes that have led to these difficulties is essential, and in this the influence of engineers, who form so large and growing a body of the community, is imperative.

Heart Testing Apparatus

ELECTRICAL amplifying means of examining the action of the human heart for diagnostic purposes are dealt with in a paper prepared by Mr. G. E. Donovan (Medical Officer of Health for the Llwchwr Urban and Gower Rural Districts) for the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS. The author describes a new method of direct visual observation of phonocardiograms (recording heart sounds) accompanied by simultaneous electrocardiograms (showing electrical variations of the heart) or plus sphygmorgrams (pulse waves) at the patient's bedside, all of which are graphically registered by apparatus that he has devised. Schematic and circuit diagrams are included with details of the high-voltage energising unit and valve amplifier providing three separate channels so that the outputs of any pair can be simultaneously and immediately observed directly on the long after-glow screen of a double-beam cathode-ray oscilloscope. The heart sounds can be heard at the same time by means of a microphone stethoscope of the piezo-electric crystal type.

Details can be analysed visually, or photographically from camera records, while the reserve gain of the two-stage amplifiers and the wide range of time-base speeds make it possible to obtain records of any size considered desirable. Heart murmurs, or other sounds, can be accentuated and undesirable ones can be attenuated. As the cathode-ray beams do not suffer from inertia effects there cannot be any overdamping or overshooting as with electro-mechanical recorders. Non-polarisable electrodes are not required; metal electrodes applied with Cambridge jelly, or

simple pads soaked in a strong saline solution, function quite well. There is no need to compensate for skin current. The apparatus is silent and rapid in operation and it cannot be damaged by shock or overload.

In visual examination by graphic records full agreement is not obtained with auditory impressions, but some workers do not feel that one should be an exact reproduction of the other because many feeble sounds are reproduced with clarity in graphic registration while other sounds are below the audible limits of the human ear. The author has therefore attempted to harmonise the two views by designing his equipment for an overall range extending from the lowest frequency to over 1,000 c/s, which band can be divided by filters so that the response can be given any desired slope. In the intermediate position of both the high-pass and the low-pass filters the sounds heard by means of the electrical stethoscope and simultaneously seen on the cathode-ray screen approximate to those which clinicians recognise as being normal.

Power from Turf

TURF as fuel for electric power generation and railway electrification were amongst the subjects recently discussed at the Irish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS, in Dublin. The chairman, Mr. J. A. Kenny, told his listeners that 50 per cent. of the fuel from the bog was wasted on the way to the consumer. He described a plan for stopping this leakage of precious fuel, namely the erection of power stations on bogs. The raw material so squandered would produce a million horse power continually for two hundred years. Mr. Kenny regretted that the Electricity Supply Board had not been foreseeing enough with regard to the utilisation of this source of light and heat. Plant could have been easily obtained, and it was available even now. The problem to be solved was intensifying with the continuance of the war.

Mr. Kenny advocated the creation by the Government of a post-war electrical development commission. Of all the means of generating electricity turf was said to be the most constant for that country. When obtaining electricity through water Eire was at the mercy of the weather; coal generation placed them at the mercy of a coal-producing country, which could at any time cut off the supplies. He advocated the immediate increase of Shannon water storage. In other rivers, apart altogether from the Liffey, there was 100,000 HP awaiting development.

The fact that Dublin depended for transport on imported fuel emphasised the wisdom of an electrical trolley system. Mr. Kenny dwelt on the necessity of electrifying railways in Eire as in other non-coal producing countries. It would be possible as well as economic when the power resources were fully tapped. The utilisation of the canals had been recently given a fruitful extension and Mr. Kenny considered that the canal barges ought to have been fitted with electric motors. The overhead electric system of the tramways could have been changed over to fifty miles of canal.

Speaking at the same meeting Mr. Warner Storey, M.I.E.E., predicted that in the near future all Irish railways would be run by electricity. The time for reconstruction might be closer than they thought. On its advent not merely tramways and suburban railways, but also main-line railways would be operated electrically, resulting in greater speed, convenience, cleanliness, and, he believed, lower costs. The most serious problem to be dealt with would undoubtedly be that of heavy capital expenditure. As an offset to that there would be lower operation costs, together with flexibility of service and reduction of upkeep and depreciation.

Since the beginning of the war four battery units had been operating on the suburban service. Between them they had covered a distance of 530,000 miles, thereby solving many fuel shortage difficulties. The shortage of fuel and the deterioration of the quality of the materials obtainable had almost reached a point at which ordinary rail transport was becoming impossible.

Colliery Power Loading

INTRODUCING a discussion on "The Problems of Power Loading" at a meeting of the MINING INSTITUTE OF SCOTLAND, in Glasgow, Mr. John Finlay, the president, said that power loading had now become of great importance. Since the outbreak of war, there had been a considerable decrease in the output of coal as a whole, and Scotland in that respect compared unfavourably with other districts. The Institute was attempting to stimulate an interest in power loading at the coal face as one of the most feasible ways of making good the deficiency.

Mining Apprentices

AT a meeting of the West of Scotland Branch of the ASSOCIATION OF MINING ELECTRICAL AND MECHANICAL ENGINEERS, held in Glasgow, when Mr. H. E. Murray, Branch president, presided over a large attendance, Mr. G. Henderson, president of the Association, led a discussion on "Post-War Training for the Engineer Apprentice."

Mr. Henderson dealt with the training under the following headings :—Possible change in the school-leaving age ; the need for improving the status of colliery electrical and mechanical engineers ; pre-war and post-war terms of apprenticeship ; and the scope of training.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Cable Identification

ONE of the minor difficulties of the mains engineer is the identification of cables in the ground. The common practice of having high-voltage cables wire-armoured and low-voltage cables tape-armoured has, until now, been of great assistance. Now that there is no armour on either there is going to be much less confidence in deciding which cables are safe to work on while alive. Would it not be possible for the outer wrapping of high-voltage cables to be impregnated with a red compound, and that on low-voltage cable with a black compound as now? "Low-voltage" cables are defined as those on which it is usual for jointers to work with the cable alive.

MAINS.

The Case for Overhead Lines

IN your issue of November 20th Mr. N. D. Watsham recognises the principle of zoning in his statement that supply engineers can strengthen their lines to meet adverse local conditions. Surely, this is zoning and all that I ask is that this zoning should have the expert guidance of the Regulations.

His simile of the moth can be condensed thus: Smallpox may play havoc in Glasgow, but as this does not materially affect the natural wellbeing of the whole community, why have legislation compelling the reporting or isolation of smallpox cases, instead of leaving it to the Medical Officer to report or isolate where he feels it is necessary?

I question Mr. Watsham's figure of upward of 2,000 miles of non-composite conductors on the primary grid. I interpret his non-composite conductors as plain copper since cadmium-copper, etc., have the zoning effect of composite conductors.

Leeds. JOHN MCCOMBE.

Intensive Electrical Engineering Course

WE are starting our fourth Intensive Course in Electrical Engineering under the Hankey Scheme, at the Borough Polytechnic, Borough Road, S.E.1, on Monday, January 25th, 1943.

To facilitate arrangements, it is desirable that students who wish to take this course should apply as soon as possible. As previously mentioned, tuition is free and maintenance allowances are paid to students while in attendance at the course. Applicants should have already obtained their Ordinary National Certificate or should be already taking that course.

I should be very grateful if you would kindly give notice of this in your paper. Most of our inquiries come through these notices and I can assure you that your help is very much appreciated.

*London, S.E.*1. W. C. S. PHILLIPS.
Head of Department of Electrical Engineering.

Electrical Laboratories

IN my letter on the above subject in last week's issue I omitted to add the following two items to my suggested list of tests to be carried out in a college or university laboratory:—

(9) *Lightning Arrestors.* — Exponential characteristics of non-linear resistance.

(10) *Liquid Resistances.* — Variation of conductivity with temperature; variation of conductivity with strength of electrolyte; heat capacity of a given volume of liquid for passage of short circuit current at constant voltage.

Witton, Birmingham. W. WILSON.

Government Contracts

BEFORE the war it was a rule that Government Departments should not dispense with the requirement that tenders should be on a competitive basis without Ministerial authority. Wartime needs have led to the waiving of the rule in a large number of instances. In its second report (Stationery Office, 3d.), the Committee of Public Accounts reproduces reasons for this given by the Treasury and states that it raises no objection to the new arrangements, provided that the responsible accounting officers satisfy themselves that where a real exercise of judgment is required this is done by sufficiently high authority—by Ministers in large and important cases.

The Committee has also taken further evidence on the general question of investigation of costs—a question which mainly concerns the Ministry of Supply. This Ministry informed the Committee that it was now able to place nearly 75 per cent. of its contracts at fixed prices and hoped to improve upon the figure. If either party is not in a position to accept a fixed price the Ministry usually arranges a contract at a maximum price, subject to costings, which it considers gives safeguards not provided by the "cost plus" type of contract.

The growth of the Ministry's business has been such that the number of contracts outstanding which contained a costing clause and would therefore require investigation when completed, had risen from 9,310 in 1940 to 14,000 in 1941 and 41,600, spread over 9,200 firms, in July, 1942.

Attention is being paid to the problems raised by the difficulty of securing an adequate staff of investigators.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE annual report of the G.E.C. Well-Wishers' Club, a Magnet House organisation formed early in the war to provide parcels of comforts for men and women members of the head office staff serving with the Forces, records that four members have been decorated. **Captain W. M. Hewitt** has been awarded the G.M., **Lieut.-Col. R. E. Keelan** the O.B.E., **Capt. G. J. Masters** the M.C. and **L/Bdr. R. Whellams** the M.M.

The report shows that although the Services are constantly claiming more of the staff subscriptions made by the remainder have been kept at a most satisfactory level. The splendid effort of the G.E.C. Dramatic Society is specially commended in the report which, besides giving a comparative cash account for the past three years, also provides statistical evidence of the growth of the club's responsibilities. There were 761 members on the books of the club. Of these twenty have been killed or have died of wounds ; four are missing ; 21 are prisoners of war and 26 have been discharged from the Forces on account of ill-health.

Following the retirement of **Mr. B. Welbourn** from the position of chief engineer of British Insulated Cables, Ltd., and his appointment to the board of directors, he was recently presented

Presentation to Mr. B. Welbourn

with a cabinet of cutlery from the members of the company's staff. In making the presentation before a large gathering of staff and directorate, Sir Alexander Roger, chairman of the company, said that they were paying honour to an old friend and colleague, who for forty-four years had devoted himself to the company. He had contributed a vast amount to the success of the **B.I.**; his untiring efforts for electrical development generally were widely known in the industry both at home and overseas, and opportunities of further service were now open to him in his new capacity as a director. In reply, Mr. Welbourn expressed his thanks to the staff and drew a comparison between the early days of the industry and the present; he recounted briefly many of the great pioneering achievements of the company and paid tribute to his colleagues.

The General Purposes Committee of the London and Home Counties J.E.A. recommends that **Mr. M. Farrer,** whose retirement we have already reported, shall receive a letter of appreciation from the Authority for his work at Twickenham. It is also proposed to pay him a superannuation allowance of £700 with an allowance of £227 per annum to Mrs. Farrer should she survive her husband.

It is announced that **Mr. B. C. Westall** is to be chairman of De la Rue Plastics, Ltd., whose registration is recorded in the Financial Section of this issue. **Mr. H. P. Bridge** is managing director and **Mr. C. G. R. Ashton** is also on the board.

The Executive Committee of the Decimal Association has placed on record its appreciation of the great value of the services rendered by the late chairman, Mr. Edward C. Barton, M.I.E.E., whose death was recently announced. **Mr. Harry Allcock,** M.I.Mech.E., M.I.E.E., a vice-president and life member of the Association, has been elected to succeed him as chairman and, on assuming office, he has expressed the hope and belief that the objects of the Association will be included in the Government's general programme of post-war reconstruction.

Mr. J. A. Northfield, M.I.Mech.E., late of Reavell & Co., Ltd., has been appointed technical manager to the Key Engineering Co., Ltd., at that company's head office in London.

Professor G. P. Thomson, D.Sc., F.R.S., has accepted the invitation of the Council of the Institute of Metals to deliver the 1943 May Lecture. His subject will be " Electron Diffraction." His father, the late Sir J. J. Thomson, O.M., F.R.S., was also a May Lecturer, his discourse—in 1915—being on " The Conduction of Electricity through Metals."

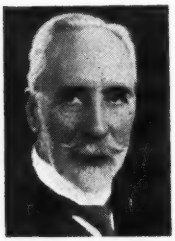
The Nottingham City Transport Committee has altered the designation of **Mr. E. S. H. Eales** from statistician to commercial manager, and **Mr. W. King,** assistant statistician, becomes statistician. The Department is now organised in four sections under the general manager, **Mr. Ben England.**

Obituary

Mr. J. Palin.—We regret to record the death, which occurred suddenly at his home, Bedmond Hill, Herts, on November 16th, of Mr. J. Palin, founder and chief of the Dalyte Electrical Co., and an authority in the design of special electrical gear for all classes of materials handling plant. He was one of the first to equip some of the largest coal and iron ore handling installations

in this country and abroad. He had many inventions to his credit.

Mr. F. Broadbent.—Our readers will learn with regret that Mr. Frank Broadbent, M.I.E.E., died at Coulsdon, Surrey, on November 25th, at the age of seventy-five. He had been living in retirement since 1937, when he left the British Electrical & Allied Manufacturers' Association after twenty-two years' service.



The late Mr. Frank Broadbent

Mr. Broadbent was a native of Ashton-under-Lyne and for a time studied law under his father, a solicitor. Then he went to Owens College, Manchester, and there and later at the Hanover Square School and Finsbury Technical College, was trained as an electrical engineer. He joined Woodhouse & Rawson in 1885 and in 1887 went on to Spagnoletti & Crookes. Two years later he became superintending engineer with J. H. Holmes & Co., Newcastle-on-Tyne. During these years he was concerned in the lighting of London railway stations, hundreds of steamships, and factories of all kinds, and with the electrical equipment of many printing works. The experience thus gained well equipped him for the role of consultant and he went into partnership with a former Hanover Square tutor, Mr. H. D. Wilkinson.

His consulting work continued until 1915, when the late D. N. Dunlop invited him to join the B.E.A.M.A. in a temporary capacity to deal with standardisation matters. This work expanded and Mr. Broadbent also served the Association in a number of other directions, including the organisation of overseas branches and on the Traffic Committee, with the result that the " temporary " arrangement lasted until 1937. In making a presentation on behalf of the staff upon Mr. Broadbent's retirement, Mr. V. Watlington, the Director, spoke highly of his services to the Association and to the electrical industry.

Apart from his business activities many electrical men will remember him for his books " Dynamo and Motor Attendants " and " Chats on Electricity "; about 50,000 copies of the former were sold.

The funeral took place at Croydon Crematorium on Saturday last. The principal mourners were his daughter, sister, and niece, and the B.E.A.M.A. was represented by Messrs. E. A. Weekes, J. J. Conlan and T. M. Stubbs.

Mr. J. M. Bennett.—The death occurred at Sidcup recently at the age of forty, of Mr. John Morrison Bennett, a member of the Strand Electric & Engineering Co., Ltd. He joined the firm in 1919, and after spending some time in the works became manager of the sales department for a period and then specialised in spectacular lighting for pageants and exhibitions. Many of the electrical effects of the Ideal Home Exhibitions were devised by him and two outstanding pageants arranged and supervised by him were held at the Tower of London and the Royal Naval College, Greenwich.

Forthcoming Events

Institution of Electrical Engineers.—*Transmission Section.*—Wednesday, December 9th, 5.30 p.m. Paper : " Some Problems in Transmission Line Design," by Mr. A. Burke (to be presented by Mr. J. J. O'Doherty).

Installations Section.—Thursday, December 10th, 5.30 p.m. Paper : " The Application of Electricity to Mine Pumping," by Messrs. G. B. Alvey and N. Tetlow.

North-Western Centre.—Saturday, December 5th, 2.30 p.m. Engineers' Club, Manchester. Paper : " The Electric Spark in Air," by Dr. J. M. Meek. *Students' Section.* — Saturday, December 12th, 2.30 p.m. Engineers' Club, Manchester. Paper: " A Review of Modern Methods of Feeder Protection," by Miss J. Allam. 5.30 p.m. Manchester University Unions. Christmas dance (tickets, 3s. each, from Mr. B. V. Poulston, 52, Wellington Road, Timperley).

North Midland Students' Section.—Saturday, December 5th, 2.30 p.m. Griffin Hotel, Boar Lane, Leeds. Chairman's address by Mr. R. J. Griffiths on " The Manufacture and Installation of Air Space, Paper Core, Telephone Cables."

South Midland Centre.—Monday, December 7th, 6 p.m. James Watt Memorial Institute, Birmingham. " Fluorescent Lamps," by Messrs. L. F. Davies, H. R. Ruff and W. J. Scott.

Northern Ireland Sub-Centre.—Tuesday, December 8th. Discussion on Mr. L. C. Grant's paper " Electrical Industrial Installations," to be opened by Mr. F. W. Parkinson.

Dundee Sub-Centre.—Thursday, December 10th. Paper by Mr. H. H. Broughton.

North Midland Centre.—Saturday, December 12th, 2.30 p.m. Leeds. Paper : " Public Address Systems," by Mr. S. Hill.

London Students' Section.—Saturday, December 12th, 3 p.m. Lysbeth Hall, Soho Square, W.1. Dance. Tickets, 2s. 6d. single, 4s. 6d. double.

Association of Mining Electrical and Mechanical Engineers.—*South Wales Branch.*—Saturday, December 5th. " Brains Trust."

Illuminating Engineering Society.—Tuesday, December 8th, 5 p.m. Royal Society of Arts, John Adam Street, W.C.2. Discussion on " Lighting and Post-War Reconstruction (Guidance, Specification and Legislation)," to be opened by Mr. A. G. Higgins, Barrister-at-Law.

Institute of Fuel.—Thursday, December 10th, 2.30 p.m. Connaught Rooms, London, W.C.2. Paper : " Fuel Economy at Collieries," by Mr. H. E. Partridge.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, December 11th, 6 p.m. Mining Institute, Newcastle. Paper : " Electrical Equipment of Shipyards," by Mr. H. M. Coatsworth.

Association of Supervising Electrical Engineers.—Saturday, December 12th, 2.15 p.m. Lighting Service Bureau, 2, Savoy Hill, W.C.2. Lecture on " Electricity Supply," by Mr. J. I. Bernard.

Junior Institution of Engineers. — Saturday, December 12th, 2.30 p.m. 39, Victoria Street, S.W.1. Presentation of awards and induction of Sir David Milne-Watson as president.

COMMERCE and INDUSTRY

Engineers for the Forces. Avoiding the Peak.

Engineering Cadetships

IT has been decided by the Ministry of Labour and National Service that the conditions for the grant of engineering cadetships shall be modified. The revised conditions are as follows:

Boys aged 16, 17, 18 and 19 are invited to apply for cadetships if they were born in 1923 or 1924; or having been born since 1924 they left school before November 1st, 1942, or their notice to leave school at the end of the current term was given before that date; and if they are not employed in any branch of engineering and have not started upon a full-time course for an engineering degree.

As regards England and Wales applicants must have obtained a credit in mathematics or general science or physics in the School Certificate examination; or have satisfactorily completed a three years' course at a junior technical school; or have, *e.g.*, as part-time technical students, reached the necessary standard of knowledge of mathematics or general science or physics.

Scottish applicants must have completed satisfactorily not less than four years of an approved senior leaving certificate course and have shown proficiency in mathematics or science (including physics) or technical subjects; or have otherwise, *e.g.*, as part-time technical students, reached the necessary standard in one of the three subjects specified.

The further development of the scheme of engineering cadetships is at present under consideration. In the meantime, arrangements should not be made for boys to leave school with the idea of their becoming eligible for engineering cadetships; plans are being worked out for the selection of boys for cadetships while they are still at school.

Commissions in Technical Corps

Regular commissions in the Royal Army Ordnance Corps and the Royal Electrical and Mechanical Engineers can now be granted to selected candidates. In making this announcement the War Office states that it intends to make full use of the wide and varied experience brought into the Army from all branches of the engineering profession. At the same time full consideration will be given to men who have proved themselves in war even though they may not possess academic qualifications.

Candidates for these commissions must be between 23 and 31 years of age except those who are appointed from the ranks of the Regular Army.

The Paper Target

The fact that the weekly quantity of waste paper collected is now in the region of 18,000 tons makes it seem a simple matter for a large industry like ours to raise 5,000 tons in a few weeks. This figure was made the target for the remainder of the year and there are still about four weeks to go.

The Electrical Waste Paper Recovery Committee suggests that there are still great potentialities in the offices and libraries of electrical concerns and the latter are therefore urged to turn out their old files, unneeded books, receipts, correspondence and old trade papers.

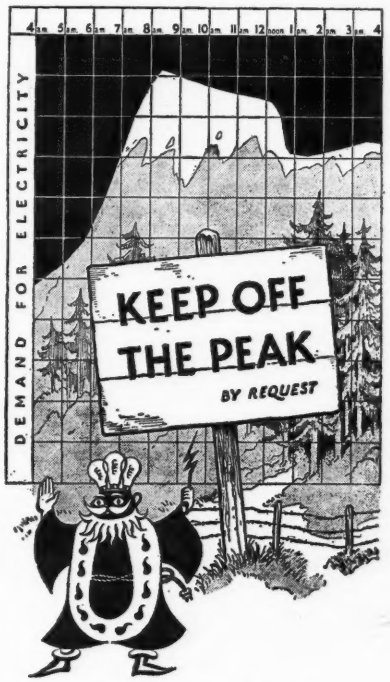
The Committee, whose address is 2, Savoy Hill, W.C.2, will give advice and help to overcome any difficulties.

Wear and Tear Allowances

Referring to the recent increase in the allowances for income tax purposes in respect of the wear and tear of generating plant, the *I.M.E.A. Journal* says that electricity undertakings should submit claims for the additional allowance for 1941-42 to their Inspectors of Income Tax as soon as possible. The settlement of such claims may be made by repayment by the Inland Revenue authorities or by deduction from the amount due for 1942-43.

"Anti-peak" Publicity

On several recent occasions we have expressed our appreciation of the effective advertisements employed by the Edmundson group of electricity supply companies. One of their latest



A cautionary advertisement

illustrates in an amusing way the " peak " with which the public is now becoming vaguely familiar. The picture (reproduced herewith) shows that a concrete reality is given to an abstract idea and conveys the message that " Excelsior " is not only a strange, but an unwelcome device in these times.

The accompanying text explains that the factories want most of the available power from 8 a.m. to 1 p.m. and citizens are therefore performing a useful national service by refraining from switching on their fires during these hours.

Industry After the War

To advise Sir William Jowitt, Paymaster-General, on the industrial aspects of post-war reconstruction, the F.B.I., the British Confederation of Employers and the Trades Union Congress propose to set up a joint committee.

The Work of the Red Cross

There are now over eleven million subscribers to the Red Cross Penny-a-Week Fund, and many of these, no doubt, would like to know how the fund is being administered. This desire has now been met by the publication of " The Story of a Wartime Miracle " (price 4d.) which gives the history of the Fund, and the manifold activities of the Red Cross organisation. Over £3,000,000 in pennies has been raised and the good work which has, and is being, accomplished as a result of the weekly subscriptions makes an interesting story.

Water Power and Land Values

In the House of Commons last week Mr. M. Macmillan asked whether any special measures were being taken to prevent speculative dealing in such land in Scotland as was likely to be affected by the reconstruction proposals of the reports of the Council of ex-Secretaries of State, with special regard to those areas in which hydro-electric development was anticipated.

Mr. Johnston, Secretary of State for Scotland, said that the interim report of the Uthwatt Committee recommended that, to obviate increases in the cost of land required for public purposes due to speculative dealings, the compensation payable on public acquisition or control of land should not exceed sums based on the standard of values at March 31st, 1939. The Government had already announced that it accepted this principle and would in due course introduce legislation to give effect to it.

Canteen Catering

There are probably times when, owing to delays in delivery or other causes, industrial canteens find food stocks are low, and that the every-day menu cannot be managed. To tide over such periods the Industrial Welfare Society, 14, Hobart Place, London, S.W.1, has published a useful booklet entitled " Practical Canteen Catering " (price 2s.), in which a large variety of recipes is given for using the cooking materials that may be available. Generally for each dish a basic recipe is given with alternative flavourings and ingredients, and the menus include dinners and snacks. Quantities given are based on portions for 20-25 and 100 persons.

New I.M.E.A. Centre

The Incorporated Municipal Electrical Association states that progress has been made in the setting up of the new South-West England and South Wales Centre of the Association and it is hoped to hold the first ordinary general meeting in January.

Lighting in a Tool Factory

Under war conditions, with Continental supplies cut off, many of the lesser-known British industries have been greatly expanded to meet increased demands. A typical example is shown in the accompanying illustration taken in the factory of a well-known firm manufacturing mining tools. The capacity of this factory has been increased by alterations which included the adaptation of existing buildings. The picture, showing part of the main shop, was taken to show how improved lighting has been incorporated in the general scheme of expansion.

" Cosmos " lighting in a works producing mining drills

The new lighting was planned by the Illuminating Engineering Department of the Metropolitan - Vickers Electrical Co., Ltd., and the installation includes about 120 " Cosmos " lamps in " Metrovick " reflectors, with a total load of about 30 kW. The general lighting is provided by 300-W lamps in dispersive reflectors mounted at a height of about 12 ft. while the fitting benches are lit by 100-W lamps in vertical elliptical reflectors mounted at 2 ft. 6 in. above bench level. The service illumination is 10/15 ft.-candles and local lighting on machines

in the factory has been found unnecessary.

In the inspection room where the work includes gauging and micrometry, bench lighting has been provided by means of 150-W lamps in vitreous enamelled reflectors fitted with diffusing visors. These, mounted at 2 ft. 6 in. above bench level, give an illumination of 30 ft.-candles on the work.

New Civic Restaurant at Finchley

Finchley's fourth civic restaurant was officially opened on November 7th, by Mr. Vincent Massey, High Commissioner for Canada, who was accompanied by Sir Kenneth Clark, Director of the National Gallery, and Lady Clark.

The Essex Civic Restaurant was originally the Essex Park Methodist Church Hall, and is situated in Ballards Lane, Finchley, N.3, on the corner of Essex Park. It therefore received the name of "The Essex" and the mural paintings on the walls have followed this theme. The large painting above the bar measures 12ft. by 8ft., and shows the meeting of Queen Elizabeth with the Earl of Essex. On one side of the hall, where the building adjoins the church, there are dummy windows and these have been filled in by paintings of Sir Walter Raleigh, Philip of Spain and English and Spanish galleons. These paintings were originated and executed by Mr. Bruce McKay, a member of the Electricity Department's staff, and he was also responsible for the main decorative scheme of the hall.

The Essex Civic Restaurant, Finchley

The kitchen is equipped with solid fuel, electricity, and gas cooking equipment, supplied from the Ministry of Food Pool and there is ample capacity and equipment to cater for 1,000 meals daily. The electric cooking apparatus consists of one three-phase double-oven range, one roasting oven, two steaming ovens and two hot-cupboards. There are two large gas boilers, one gas café set, two 6-ft., double-oven solid fuel ranges and two solid fuel boilers. In addition to this equipment there is a potato-pealing machine, electric mixer and many other devices which go to make the modern kitchen. The kitchen itself is large and well arranged and should be capable of being operated with the minimum number of staff.

A separate "cash and carry" service is provided so that customers do not have to enter the main restaurant.

The civic restaurants in Finchley are controlled by the communal feeding officer, Mr. G. R. Westlake, M.I.E.E., general manager and engineer of the Finchley Corporation Electricity Department, assisted by Mr. C. Bradley, A.M.I.E.E., consumers' engineer, and the total output from the four restaurants is now approaching 2,500 lunches per day. "The Essex," after a fortnight's working, is providing 450 to 550 lunches daily.

Fuel Economy at Darlington

A novel feature of a "Battle for Fuel" exhibition held recently at Darlington was a "fuel intelligence" competition in which savings certificates were awarded to the winners in three age groups (between ten and sixteen years). Clues to assist competitors were to be found at the exhibition, but out of 247 forms returned completed to the Electricity Offices (850 were issued) only one was entirely correct.

The exhibition was opened by Lord Gainford and there was a total attendance of 4,260. The borough electrical engineer (Mr. T. E. Daniel) is secretary of the local "Battle for Fuel" campaign.

Trade Announcement

Mr. H. H. Leage, of 46, Lincoln's Inn Fields, W.C.2, informs us that he has terminated his agency for G. P. Dennis, Ltd.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

TALON cable clips.

ELECTRICITY SUPPLY

Portland Ruling Relaxed. Costly Canadian Line.

Aberdeen. — DISCONTINUATION OF MINIMUM CHARGE.—Suspension of the mininum charge of 10s. per half-year on the flat rates for lighting power and heating is recommended by the Electricity Committee. Mr. A. Gardner, city electrical engineer, reporting that the Ministry of Fuel and Power had issued a Statutory Order imposing a limit of 25s. yearly on the minimum charges made for the supply of electricity, said that the charge in Aberdeen, which was below the minimum, was justifiable in view of the fixed expenses, but in order to encourage users to save fuel he advocated the suspension of the charge.

Croydon.—FLUORESCENT ILLUMINATION.—The General Purposes Committee has recommended the installation of fluorescent lighting in the rebuilt portion of the town hall. It is proposed that this type of lighting should be provided on the mezzanine floor and in the ground floor room which is to be used as a drawing office. The additional cost compared with ordinary lighting is £114.

Kent. — SHELTER HEATING. — The County Council has approved the heating of air-raid shelters in Public Assistance Institutions.

London.—STREET LIGHTING AND ECONOMY.—Complaints of waste of electricity have been caused at Battersea by the fact that, owing to staff depletion, it is impracticable to complete the switching off of the modified street lighting in the customary time. Moreover, on moonlit nights the amount of light emitted by the wartime lanterns has no appreciable effect, thus giving grounds for further complaint. After considering a report by the borough engineer, however, the Highways Committee feels that in view of all the circumstances the present switching methods should continue.

Portland.—"TRUCE" RELAXED. — Certain cases of hardship have arisen as a result of the Council's decision not to allow new supplies of gas or electricity to be provided where one of the services is already available. Drawing attention to these at a recent meeting of the Gas and Electricity Committee, the clerk said that such cases mainly arose where persons owning their own cookers and other appliances moved into houses not possessing the requisite type of supply. The Committee therefore decided that in cases of exceptional hardship a supply should be afforded, subject to labour and material being available and the cost being borne by the consumer.

Overseas

Canada.—A MILLION DOLLAR LINE.—The *Electrical News* (Toronto) reports that a transmission line is being constructed from Port Arthur, Ontario, to the Steep Rock iron ore mine which is being developed to guard against a possible shortage. The distance is 225 miles and the line will cost about a million dollars. The cost is being borne by the Hydro-Electric Power Commission of Ontario on behalf of the Government.

South Africa.—REDUCED LIGHTING IN CAPE TOWN.—Street lighting in Cape Town has now been dimmed in accordance with the new regulations. Many of the globes have been removed in the secondary streets and suburbs and in the main streets the upper portions of lamps have been painted black to reduce visibility from the air.

LOAN.—Paarl Municipality (Cape Province) is likely to raise a loan of £20,000 to extend the electricity undertaking, which at present cannot cope with the demand.

TRANSPORT

Darlington. — MORE TROLLEY-BUSES. — The Ministry of War Transport has increased its allocation of new trolley buses to the Town Council for delivery during 1943-44 from four to eight.

Middlesbrough. — COST OF REMOVING TRAM RAILS.—When the question of taking up old tram rails for scrap was discussed at a meeting of the Middlesbrough Highways Committee, the borough engineer (Mr. C. Gorman) said that the town's rails would realise £4,200 as scrap, but the cost of reinstating the roadway would be £24,800, and he asked who would pay the difference. It was stated that the Ministry of Transport was offering £8 a ton, an increase of £2, for scrap. The borough engineer stated that Middlesbrough's tram rails were anchored in concrete and he estimated that 80 men would be needed to remove the rails. It was decided to refer the position to the Ministry.

RADIO & TELEPHONY

China.—TELECOMMUNICATIONS CONFERENCE.—A *Reuter* message from Chungking states that the Chinese Ministry of Communications has announced that a national telecommunications conference is to be held in Chungking to discuss communications in free China, including completion of long-distance telephone and radiophone networks.

India.—NEW TRANSMITTER.—Sir George Cunningham, Governor of the North-West Frontier Province, and Mr. A. S. Bokhari, Controller of Broadcasting, spoke at the inauguration of the new Peshawar radio station, states the *Indian and Eastern Engineer*. Mr. Bokhari pointed out that the 10-kW transmitter had twice the power of those at Lahore, Lucknow, Dacca and Trichinopoly and they hoped that it would not only serve the whole province but would bring the province into closer daily contact with the rest of the country.

Switzerland.—TELEPHONE PROGRESS.—According to the *Journal des Télécommunications* the demand for connection with the telephone system is growing so rapidly in the Zurich area that the erection of a new telephone exchange at Wiedikon, Zurich, has been decided upon. At first it will be able to deal with up to 6,000 subscribers, but it is being planned to accommodate eventually 20,000 lines.

Welded Cargo Ships

Marine Engineer's Novel Design

AN urgent plea that cargo ships as well as their propelling machinery should be specifically designed to withstand the service conditions encountered in wartime is made in considerable detail in a paper prepared for the INSTITUTE OF MARINE ENGINEERS, by Mr. W. S. Burn, who is a consulting engineer chiefly concerned with oil engine design.

The author's proposals are novel in some respects and unconventional in most others, but his proposed design is well suited to conversion for post-war service. His endeavour is to demonstrate that shipbuilding capacity can be made more effective by increasing the speed of vessels, thus enlarging the amount of cargo carried for a given weight of steel, and at the same time improving the ability of ships to resist enemy action, so lessening the need for protection in convoy. New types of ships are required, for it seems evident that deck construction with loose hatches and present methods of hull sub-division and bulkhead arrangements are unsuitable ; instead it is suggested that as great a part of a cargo ship as is practicable should be built on tanker principles, intensively developing each design to ensure functional suitability.

Fabrication Economies

Standardised designs for fabrication are essential for economically increasing the effectiveness of shipbuilding man-power at present available. If ships can be built in the United States with less than five per cent. of skilled shipyard workers when aided by a high degree of organisation, technical and productive, together with mechanical equipment to reduce physical effort and lessen the need for personal skill, then it seems reasonable to assume that British unskilled labour will be equally competent to construct those parts of vessels that can be fabricated and welded. Shaped parts of the hull like the sides can be produced by skilled British platers and riveters in less man-hours than by the American system, but flat surfaces like bulkheads and decks and bottoms that are adaptable to " machine welding " should be pre-fabricated on American lines for economising man-hours.

Thus a combination of the old and new methods is favoured by the author, who submits that it is not economical in national man-power to build, or operate, vessels of less than 12,000 tons deadweight, or that they should travel at less than 18 knots, each requiring 12,500 BHP. He maintains that oil engines can be designed to be only slightly heavier and to consume only 25 per cent. more fuel by weight than coal-burning steam plant of 2,200 SHP for 10.5 knots. It is claimed that at least three times the amount of cargo could then be carried, unconvoyed, for a comparatively modest increase in man-power of a non-shipbuilding character per vessel.

It is proposed to allocate 12 per cent. of the total power to a bow " puller " propeller, with 88 per cent. for the stern " pusher " propeller. It is claimed that the engines can be so designed that the bow propeller can produce over half the normal speed achievable by both working together. The main purpose of double-ended propulsion and steering is to prevent disablement by a single bomb or torpedo. The heavy oil engines should be of high speed to reduce weight ; in some cases AC transmission could be used between the engines and propellers. By such means the weight of machinery should be little more than in an ordinary ocean-going cargo vessel, but the power is expected to be six times as great. The greater fuel consumption is described as a small matter to be set against the other " enormous advantages " claimed for the proposed " cargo warship."

In his consideration of the best economic use of shipbuilding man-hours the author suggests that the crux of the problem is the British marine engine position, which he examines in some detail, comparing alternative types of plant and commenting at length on oil engine design and Diesel-electric plant. Incidentally he also enumerates the advantages of turbo-electric plant, especially AC equipment, for ship propulsion in wartime. The latest American tankers are being provided with AC plant, whereas the author does not know of any British ships being so fitted.

Virtues of Welding

External torpedo " blisters " interfere with the optimum shape of the hull for easy propulsion. Instead it is proposed to make the inner plating of the " double side skin " immensely strong, which welding will facilitate, whereas the ship's sides are to be designed on hydromatic principles though structurally much weaker. Rather than attempt to make the outer hull resist large explosions the author prefers to arrange organised weak areas with an internal structure of sufficient independent longitudinal strength. For this purpose riveted joints are very suitable, the rivet holes allowing for " perforated paper " rip effects. Welding saves steel and therefore weight, permitting heavier plates to be used

for thicker deck protection. Many other constructional details are proposed, all conducive to invulnerability.

Welded joints in plates and structural parts are nearly twice as strong as riveted ones and they also permit structural design to be simpler for more even stressing throughout. It is proposed to weld the joints of all the tank portions of the ship, including the side plating of the forward and after portions. Welded construction enables the steel partitioning of the accommodation spaces to serve as reinforcement for the deck, so making a strong structure with minimum framing.

Any increased cost of the hull due to change of form to suit higher speed can be offset by making forward and aft lines more nearly identical as well as by the use of symmetrical bar sections, rendered possible by welding, so increasing the number of parts capable of being made from a given template or jig. The machine welding of all flat construction, such as bulkheads, will much increase the output of a given amount of man-power ; a further improvement of 10 to 15 per cent. is obtainable by extension of that principle.

Welded sides are not really necessary in wartime ; in fact, the author suggests that they may be a disadvantage in certain circumstances, but he believes it will be absolutely essential for the entire internal structure, such as the inner bulge wall, bulkheads and the decks to be designed for machine welding or at least efficient " down " welding by hand. This will necessitate all the internal parts of the ship being made in special fabrication works, so that the proposed design involves a measure of shipyard reconstruction.

New Building Methods

But most British shipyards are fundamentally unsuited to immediate adaptation to the use of economic welded construction, which to-day implies that relatively large sections are constructed under factory conditions for mere assembly on the shipyard berths, because of lack of space at the head of the slipways and of shipyard transport facilities. The author suggests that the practical solution of the problem is to provide new regional prefabrication works in each river and dock area engaged on shipbuilding of sufficient capacity to cater for that area, sections and parts fashioned in riverside factories upstream to be transported by water on self-propelled pontoons down to the river-end building berths, with cranage for transporting sections up the yards. This will make the best use of existing equipment and cause least social disturbance to the workers.

Almost all the auxiliary plant of the author's proposed vessel and of its engines would be driven by AC motors, which would permit of remote control from above the water line. Electric cranes are preferred to derricks for cargo handling. Their driving motors and winding gear would be protected below deck and their control posts would be unusually short and fitted with a steady pintle well below deck.

The holds would be cross ventilated, utilising the folding crane posts as air inlets and outlets, each having its own electrically-driven forced draught or exhauster fan. All air ducts would be of substantial design, welded into the ship's structure to avoid weak ventilating shafts. The engine room would have an exhaust fan with ducts up the funnel casing. Air for the engines would be taken from the side alleyways and accommodation spaces, where a built-in duct system would provide for the air in each cabin to be heated electrically as required.

Modern Synthetic Rubbers

THE extent to which synthetic plastics have been developed in Germany, Russia and America has been due to the desire to become independent of rubber, while in England, with its control of the bulk of the world's rubber supply, the tendency has been to be content to develop in those directions in which plastics are superior to rubber. A valuable addition to the rather scanty literature of the subject is a new book, " Modern Synthetic Rubbers " by Harry Barron (pp. 274 ; illus. 76) published by Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2, price 25s.

Anyone who has been in contact with the many applications of these new materials cannot but admire the work of the band of chemists and technologists responsible. The author is one of this group and he enthusiastically visualises present circumstances resulting in the firm establishment of synthetic materials in practically all cases where rubber is now used. There is no doubt that for the immediate future such must be the case and widely different industries must become " plastic conscious."

The first section contains useful statistics, while the second reviews the subject from the early work on analysis of rubber to modern co-polymerisation. The chapters in this section give a clear insight into the raw materials used and the general chemistry of the subject, and are logically followed by the most important part of the book, dealing with the production, composition, compounding and properties of some of the numerous synthetics, such as Buna, Neoprene, Polythene, Thiokol and Polyvinyl-chloride. Variation in the compounding materials results in useful control of the properties obtainable. Just as the universal use of rubber is largely due to the great experience of the compounder, so the future of the plastics industry will largely depend on the rapidity with which its technicians acquire equal skill.

The chapter on terminology is intentionally provocative. An early agreement on the nomenclature to be used in this rapidly expanding industry is necessary, but the engineer will probably find some difficulty in agreeing that such names as " Elastomers," " Elastenes " and " Elastoplasts " are sufficiently distinctive. —W.C.B.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The English Electric Co., Ltd., has made an offer for the ordinary shares of D. Napier & Son, Ltd., makers of aero engines, etc., on the basis of £1 of English Electric ordinary stock for five ordinary 5s. Napier shares. The directors of Napiers have accepted the offer and advise other shareholders to do the same. Completion of the arrangement is contingent upon acceptance by holders of not less than three-quarters of the Napier shares (of which there are 2,184,000), or such smaller proportion as the English Electric Co. may agree, by December 28th. The Ministry of Aircraft Production has offered to purchase fixed assets acquired by the Napier concern in connection with war production for £750,000 and to lease them to the company for the duration of the emergency. The Napier directors will retire, receiving compensation for loss of office where they hold executive positions.

Ferranti, Ltd., are holding an extraordinary general meeting on December 3rd, at which a resolution will be submitted authorising the company to increase its borrowing powers. It will be provided that the amount at any one time owing in respect of moneys so raised or borrowed shall not exceed a sum of £2,000,000.

The Associated Equipment Co., Ltd., states that the profit for 1941-42, after providing for depreciation but before meeting taxation, is £701,500 (against £692,500). The amount required for taxation is again £560,000 and the transfer to general reserve is raised from £18,000 to £29,000. The dividend is maintained at 7½ per cent., tax free.

John I. Thornycroft & Co., Ltd., report a profit of £130,895 for 1941-42, against £124,152 for the previous year. The dividends are maintained at the same rates by final payments of 5¼ per cent. on the preferred ordinary shares (making 9 per cent.) and 8 per cent. on the ordinary shares (making 13 per cent.).

The London Passenger Transport Board announces that out of £12,583,000 London Transport 4½ per cent. T.F.A. stock, the holders of about £9,600,000, or 76 per cent. of the total, have elected to exchange into the new 3 per cent. guaranteed stock, 1967-72, on the terms already announced. The balance of the authorised issue of £12,905,641 3 per cent. guaranteed stock will be issued for cash in accordance with the arrangements already made, and the unconverted London Transport 4½ per cent. T.F.A. stock will be repaid in cash on January 1st.

Thomas de la Rue & Co., Ltd., have declared an interim dividend of 10 per cent. No dividend was paid last year. The directors announce that they have formed a company—De la Rue Plastics, Ltd.—with a capital of £1,000,000 to take over and operate the plastics branch of the business. No part of the capital will be offered for subscription. In addition it is proposed to form another company—De la Rue Stationers, Ltd.—with a capital of £100,000 to deal with the playing card and stationery side of the company's activities.

Joseph Lucas, Ltd., are paying a final ordinary dividend of 12½ per cent., again making 15 per cent., less tax, for the year.

Edmundsons Electricity Corporation, Ltd., is again paying an interim ordinary dividend of 2½ per cent.

Hick, Hargreaves & Co., Ltd., are again paying an interim dividend of 2 per cent.

Marco Refrigerators, Ltd., are maintaining their ordinary dividend at 2½ per cent. for the past year.

John Shaw & Sons (Wolverhampton), Ltd., announce the payment of a dividend of 7½ per cent. in respect of the past year (same).

Burco, Ltd.—From a net profit of £23,599 for 1941-42 (against £22,017 for the preceding year) a dividend of 15 per cent. is being paid (same).

New Companies

Auto Electric Service (Stourbridge), Ltd.—Private company. Registered November 17th. Capital, £5,000. Objects: To acquire the business of electric and welding engineers carried on by W. E. Leech and J. E. Leech at Bridgnorth Road, Stourbridge, as the Auto Electric Service (Stourbridge) Co., and to carry on the business of electrical, telephone, wireless, mechanical, welding and general engineers, metal workers, armature winders, etc. Subscribers: J. Woolley, 6, Meriden Avenue, Wollaston, Stourbridge, and E. T. Chasser, 22, Heath Street, Stourbridge. Solicitors: Collis, Higgs & Sons, Stourbridge.

R. A. Morgan (Electrical), Ltd.—Private company. Registered November 19th. Capital, £1,500. Objects: To acquire the business of automobile, electrical and mechanical engineers carried on by R. A. Morgan at Florence Street, Hitchin, etc. The directors are R. A. Morgan, 12, Bearton Green, Hitchin, Herts, and G. W. Tompkins, 93, Bearton Road, Hitchin, solicitor's managing clerk. Registered office: Florence Street Works, Hitchin, Herts.

Crossway Engineering Co., Ltd.—Private company. Registered November 21st. Capital, £100. Objects: To carry on the business of motor, electrical and general engineers, tool and accessory makers, etc. The directors are: C. W. Hutfield, 42, The Crossway, Gosport, Hants and F. T. Grubb, "St. Georges," Locks Road, Warsash, Hants. Secretary and solicitor, A. G. C. Nicholson, 1, Grove Road, Gosport, Hants.

Walton Engineering Co., Ltd.—Private company. Registered November 20th. Capital, £100. Objects: To carry on the business of constructional, mechanical, motor, electrical and general engineers, sheet metal workers, platers, etc. The subscribers are: S. Walmsley, 50, Pall Mall, S.W.1, secretary, and Elsie M. Bisset, Park Barn Farm House, Broad Street Common, near Guildford. Secretary: S. Walmsley.

Crometer Engineering Co. (Stockport), Ltd.—Private company. Registered November 21st.

Capital, £200. Objects: To carry on the business of constructional, electrical, radio, motor, water, heating, scientific and general engineers, tool makers, platers, etc. The directors are C. V. Cooper (permanent managing director), and Bessie Cooper, both of Marple Cottage, Church Street, Marple.

Companies' Returns

Statements of Capital

Laurence, Scott & Electromotors, Ltd.—Capital, £700,000 in 200,000 5 per cent. cumulative preference shares of £1 and 876,020 "A" ordinary and 1,123,980 "B" ordinary shares of 5s. Return dated June 3rd. 174,750 preference, 480,000 "A" ordinary and 1,123,980 "B" ordinary shares taken up. £474,490 paid (£1 on the preference, 6s. 3d. on 200,000 "A" ordinary, 9s. 6d. on 160,000 "A" ordinary and 5s. on 120,000 "A" ordinary and 524,900 "B" ordinary shares). £149,755 considered as paid on 599,020 "B" ordinary shares. Mortgages and charges outstanding: Nil.

Madras Electric Tramways (1904), Ltd.—Capital, £300,000 in 150,000 preference and 150,000 ordinary shares of £1. Return dated July 24th. 125,000 preference and 100,000 ordinary shares taken up. £135,240 paid on 92,500 preference and 42,740 ordinary shares. £89,760 considered as paid on 32,500 preference and 57,260 ordinary shares. Mortgages and charges: £102,900.

W. T. Henley's Telegraph Works Co., Ltd.—Capital, £1,500,000 in £1,200,000 ordinary stock and £200,000 preference stock. Return dated July 31st. All stock taken up. £612,480 paid. £887,520 considered as paid. Mortgages and charges: Nil.

Western Telegraph Co., Ltd.—Capital, £3,500,000 in £3,118,950 ordinary stock and 38,105 shares of £10. Return dated July 9th. All stock taken up. £2,339,650 paid. £779,300 considered as paid. Mortgages and charges: £818,675.

West London & Provincial Electric & General Trust, Ltd.—Capital, £390,000 in £198,000 ordinary and £192,000 preference stock. Return dated June 18th. All stock taken up. £264,000 paid. 126,000 considered as paid. Mortgages and charges: £200,000.

Culm Valley Electric Supply Co., Ltd.—Capital, £80,000 in £1 shares. Return dated July 24th. 75,000 shares taken up. £69,410 paid on 69,410 ordinary shares. £5,590 considered as paid on 5,590 ordinary shares. Mortgages and charges: Nil.

Teignmouth Electric Lighting Co., Ltd.—Capital, £80,000 in ordinary shares of £1 each. Return dated July 24th. All shares taken up. £69,500 paid, £10,500 considered as paid. Mortgages and charges: Nil.

Sheerness & District Electric Supply Co., Ltd.—Capital, £110,000 in £1 shares. Return dated June 18th. All shares taken up. £85,000 paid. £25,000 considered as paid. Mortgages and charges: Nil.

Minehead Electric Supply Co., Ltd.—Capital, £130,000 in £1 shares (29,000 first preference and 101,000 ordinary). Return dated June 12th. All shares taken up. £115,027 paid. £14,973 considered as paid. Mortgages and charges: Nil.

Morecambe Electrical Equipment Co., Ltd.—Capital, £3,000 in £1 shares. Return dated July 25th. 2,575 shares taken up. £2,575 paid. Mortgages and charges: £7,500.

Increases of Capital

Pullars Electric Co. (Brighton), Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £5,000. To April 21st, 1942, 5,000 shares had been issued, of which S. Smith & Son (1934), Ltd., held 4,850 shares. This company was also allotted the 5,000 new shares on October 23rd, 1942.

Tipton Electrical Repairs, Ltd.—The nominal capital has been increased by the addition of £900 in £1 ordinary shares beyond the registered capital of £100.

Mortgages and Charges

Rely-a-Bell Burglar & Fire Alarm Co., Ltd.—Charge on land and 54, Wilson Street, and 2, 4 and 6, Earl Street, Shoreditch, dated November 19th, 1942, to secure £1,000. Holder: G. H. Willis, 51/2, Chancery Lane, W.C.2.

Milnes Electrical Engineering Co., (Bingley), Ltd.—Satisfaction in full on November 5th, 1942, of three mortgages dated July 18th, and October 9th, 1940, and April 14th, 1941, and registered July 29th, and October 15th, 1940, and April 28th, 1941, respectively.

North-Eastern Electric Supply Co., Ltd.—Satisfaction to the extent of £2,202,039 (outstanding balance) on November 4th, 1942, of trust deed dated October 31st, 1930, and registered November 8th, 1930, securing £2,300,000 5 per cent. consolidated debenture stock.

Receiver Released

Walmsley & Co. (Chorley), Ltd.—J. K. Tattersall, 12, Cleveland Street, Chorley, ceased to act as receiver on November 11th, 1942.

Liquidations

Gollings & Ayres, Ltd.—Particulars of claims by December 31st to the liquidator, Mr. C. E. V. Salsbury, 7, St. Paul's Square, Bedford. This notice is purely formal as all the creditors have been, or will be, paid in full.

Bankruptcies

R. T. H. Brimfield, electrical contractor, lately carrying on business as Richfield Electrical Components, at 73-78, High Holborn, London, W.C.1.—Application for discharge to be heard on December 15th at Bankruptcy Buildings, Carey Street, London, W.C.2.

J. S. Griffin, electrical engineer, 108, High Town Road, Luton.—Last day for receiving proofs for dividend December 11th. Trustee, Mr. T. Pollit, 6, The Parade, Northampton, Official Receiver.

F. J. Matson, automobile electrical engineer, 24, Rider Road, Woodhouse, Leeds.—Supplemental dividend of 7½d. in the £, payable December 11th, at 24, Bond Street, Leeds.

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71/73, Victoria Street, Birmingham, 1.

Oakes Turner & Co., Ltd., 75/79, Eyre Street, Sheffield, 1.

STOCKS AND SHARES

TUESDAY EVENING.

BUSINESS in the Stock Exchange has developed into something of a jogtrot. Prices remain firm; the Government's announcement of a new series of National War Bonds to come on tap this week, has had no effect upon the prices of existing securities. Gilt-edged stocks hold their previous levels: the tendency is for them to go better, by way of correspondence with the slightly more advantageous terms to the Government upon which the new loan is being offered to the public. Industrial shares continue to be readily taken; preference shares have reached prices at which the best-class types yield less than 4 per cent. on the money. Speculation has died down to a great extent, but undiminished popularity attaches to shares in companies which are deemed to have post-war prospects of expansion and prosperity.

Quiet Home Railways

The only feature in the Home Railway market is negative, prices scarcely moving. There is extremely little buying and little selling at present, in spite of the approach of the end of the year and the usual crop of dividend estimates that this advent produces. Optimism—or wishful thinking—looks for an increase in the dividend on Transport " C," but the price of the stock remains at 55. On Southern preferred, the dividend no doubt will be 5 per cent. for the year, the same as before. At its current quotation of 75 the stock returns £6 13s. 4d. per cent.—a good rate of payment on the money. The lack of public interest in the market as a whole has the effect of restraining improvement in the price.

Industrial Improvements

The excellent progress lately made every week by prices in the market connected with the electrical industry, has been slowed down. People who declare that the sky is the only ceiling in days of very cheap money are fain to admit that a rise in prices cannot go on without stopping occasionally for breath. Rumour has it that some of the big " institutional " holders of industrial shares have been taking their profits, and that this explains the lack of resilience shown by prices. If the rumour contains any measure of truth, it is all the more surprising to find prices holding their gains and in some cases improving upon them.

Electric Construction shares have risen 1s. 9d. to 36s. 3d. Advances are shown by Ericsson Telephones, London Electric Wire, and Switchgear & Cowans. Westinghouse Brakes at 57s. 6d.—and not too easy to buy even at 58s. 6d.—are half-a-crown higher on the week; Vactrics recovered to 9s. Allen Wests at 6s. 6d. have put on the pence, investment being attracted by the reasonably good yield of 5¾ per cent. afforded by these shares in a sound company. Aron Electrics, Associated Electricals and British Thermostat have risen 6d. apiece.

The high light of the week in this section is the offer made by the English Electric Co. for the shares of D. Napier & Sons, Ltd. The offer is £1 of English Electric stock (quoted at 46s. 6d.) for five Napier shares valued at 9s. each.

Overseas Shares

Two interesting rises amongst the overseas group of electricity supply companies are $\frac{1}{16}$ in Victoria Falls and 1s. in Whitehall Investment preference, taking the prices to £4 and £1 respectively. Victoria Falls have long been in the ranks of gilt-edged ordinary share investments; the present price is nearly the highest of the year now closing. The brighter war news has kindled a hope that the Whitehall Investment Trust may be able shortly to begin dealing with dividend arrears accumulated upon its preference shares. Atlas Investment Trust are 3d. lower at 5s. 3d. Indian electricity shares continue in favour with provincial buyers who have been following the market of late. Kalgoorlie Electrics hardened to 9s. 6d., on the successes of the Allied armies in the Southern Pacific: these have gone far to remove previous vague apprehensions of a Japanese invasion of Australia.

Joseph Lucas

Joseph Lucas, Ltd., have declared a final ordinary dividend of 12½ per cent., making 15 per cent., less tax, for the year, and maintaining a rate which has been paid annually since 1936. A seven years' record of this nature is something to be proud of, and entitles the shares to a place with those in the front line of industrial ordinary shares. At the present price of 71s. 3d., the yield on the money comes to a little over £4 4s. per cent. In 1937, the shares rose to 75s. Since then, the price has been down to 40s. in 1940. The extremes this year have been 65s. and 73s. 6d. At the last meeting, the chairman mentioned that the profit for the year then under review was entirely governed by taxation; fortunately he added, " we have quite a reasonable pre-war standard."

More Borrowing Powers

Ferranti, Ltd., are seeking powers to borrow up to £2,000,000, an extraordinary meeting being called for Thursday in this week, December 3rd. The existing borrowing powers are for £1,600,000. The extra facilities are intended for use in respect of current requirements of the business, and not, the company explains, in respect of items of the nature of capital expenditure. The

(*Continued on page* 735)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Dec. 1	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	56/–	..	4 9 3
British Power and Light	6	6	28/-	..	4 5 9
City of London	7	7	30/6	..	4 11 10
Clyde Valley	8	8	40/6	..	3 19 0
County of London	8	8	41/6	..	3 17 2
Edmundson's:					
7% Pref.	7	7	31/–	..	4 2 4
Ord.	6	6	28/–	..	4 5 9
Elec. Dis. Yorkshire	9	9	43/–	..	4 3 9
Elec. Fin. and Securities	12½	12½	49/–	..	5 2 1
Elec. Supply Corporation	10	10	45/6	..	4 9 0
Isle of Thanet	2	Nil	14/6	+6d.	—
Lancs. Light and Power	7½	7½	35/6	..	4 4 6
Llanelly Elec.	5½	5½	22/6	..	4 17 9
Lond. Assoc. Electric	4½	4	23/6	..	3 8 0
London Electric	6	6	25/6	..	4 16 0
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	40/6	+6d.	3 19 0
Midland Counties	8	8	40/–	..	4 0 0
Mid. Elec. Power	9	9	43/6	+1/–	4 4 9
Newcastle Elec.	7	7	30/–	..	4 13 5
North Eastern Elec.					
Ordinary	7	7	32/6	..	4 6 4
7% Pref.	7	7	33/6	..	4 3 7
Northampton	10	10	47/–	..	4 5 0
Notting Hill 6% Pref. (£10)	6	Nil	8¾	..	—
Northmet Power:					
Ordinary	7	7	39/6	..	3 11 0
6% Pref.	6	6	30/–	..	4 0 0
Richmond Elec.	6	6	25/–	..	—
Scottish Power	8	8	40/–	..	4 0 0
Southern Areas	5	5	22/–	..	4 11 0
South London	7	7	24/6	..	—
West Devon	5	5	22/6	..	4 9 0
West Glos.	4½	3½	20/6	..	3 8 4
Yorkshire Elec.	8	8	40/6	..	3 19 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/3	−3d.	—
Calcutta Elec.	7*	7*	31/6	..	—
Cawnpore Elec.	10	10	27/–	..	7 8 2
East African Power	7	7	28/–	..	5 0 0
Jerusalem Elec.	7	5	22/6	..	4 9 0
Kalgoorlie (10/–)	7½	5	9/6	+6d.	5 5 3
Madras Elec.	6*	4*	20/6	..	—
Montreal Power	1½	1½	25	+1	6 0 0
Palestine Elec. "A"	Nil	4*	32/6	−6d.	2 9 3
Perak Hydro-elec.	6	7	11/6	..	—
Shawinigan Power	85cts.	90cts.	17	..	—
Tokyo Elec. 6%	6	6	21	..	—
Victoria Falls Power	15	15	80/–	+1/16	3 15 0
Whitehall Inv. Pref.	5	5	10/–	+1/–	5 0 0

Company	Dividend Previous	Dividend Last	Middle Price Dec. 1	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955–60	—	3	99	..	3 0 7
1955–75	5	5	114	..	4 7 9
1951–73	4½	4½	107½	..	4 3 9
1963–93	3½	3½	102	..	3 8 8
1974–94	3½	3½	99	..	3 5 4
London Elec. Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955-75	4½	4½	109	..	4 2 7
Lond. Pass. Trans.:					
A	4½	4½	118½	..	3 16 0
B	5	5	118½	+1	4 4 5
C	3	2⅞	55	..	5 4 8
West Midlands J.E.A. 1948–68	5	5	108	..	4 12 7
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	110½	..	5 8 7
Def.	1½	1½	27	..	5 11 1
Anglo-Portuguese	8	8	23/–	−6d.	6 19 4
Cable & Wireless:					
5½ Pref.	5½	5½	107	..	5 2 10
Ord.	4	4	76½	..	5 4 7
Canadian Marconi $1	Nil	4cts.	6/–	−3d.	2 16 6
Globe Tel. & Tel.:					
Ord.	8½*	5*	32/–	..	3 2 6
Pref.	6	6	27/6	−6d.	4 7 3
Great Northern Tel.: (£10)	Nil	Nil	21½	+1½	—
Inter. Tel. & Tel.	Nil	Nil	6	..	—
Marconi-Marine	7½	7½	31/6	..	4 15 3
Oriental Tel. Ord.	16	10	57/6	..	3 9 5
Telephone Props.	6	Nil	13/–	−6d.	—
Tele. Rentals (5/–)	10	10	10/–	..	5 0 0
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	4/–	..	—
4% Inc.	Nil	Nil	10½	..	—
Brit. Elec. Traction:					
Def. Ord.	45	45	1005	..	4 9 8
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	46/3	..	4 6 6
Brazil Traction	$1½	$1	18⅜	..	—
Calcutta Trams	8	5½	19/–	..	5 15 9
Cape Elec. Trams	5	5	23/–	..	4 7 0
Lancs Transport	10	10	43/9	..	4 11 4
Mexican Light:					
1st Bonds	5	5	93½	..	5 7 0
Rio 5% Bonds	5	5	101½	..	4 18 6
Southern Rly.:					
5% Prefd.	5	5	75	..	6 13 4
5% Pref.	5	5	110	..	4 11 0
T. Tilling	10	10	50/–	..	4 0 0
West Riding	10	10	37/6	..	5 6 8

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Dec. 1	Rise or Fall	Yield £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	7½	10	32/6	+6d.	6 3 0
Assoc. Elec. :					
Ord.	10	10	47/6	+6d.	4 4 0
Pref.	8	8	39/–	..	4 2 0
AutomaticTel.&El.	12½	12½	54/–	..	4 12 7
Babcock & Wilcox	11	11	47/9	..	4 12 7
British Aluminium	10	10	49/3	–9d.	4 1 4
British Insul. Ord.	20	20	100/–	..	4 0 0
British Thermostat (5/–)	18½	18½	16/3	+6d.	5 13 10
British Vac. Cleaner (5/–)	10	15	20/6	..	3 13 0
Brush Ord. (5/–) ..	Nil	6	6/6	..	4 12 4
Callender's ..	15	15	76/6	..1/–	3 18 4
ChlorideElec.Storage	15	15	76/3	..	3 18 9
Cole, E. K. (5/–) ..	Nil	7	14/6	..	2 8 4
Consolidated Signal	17	17	85/–	..	4 0 0
Crabtree (10/–) ..	17½	17½	35/–	..	5 0 0
Crompton Parkinson Ord. (5/–) ..	30	20	24/–	..	4 3 4
E.M.I. (10/–) ..	Nil	6	17/9	..	2 7 7
Elec. Construction	10	10	36/3	+1/9	5 10 4
Enfield Cable Ord.	12½	12½	58/6	..	4 5 7
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	46/6	+6d.	4 6 0
Ensign Lamps(5/–)	25	25	18/–xd	–6d.	6 18 10
Ericsson Tel. (5/–)	22*	20*	42/6	+6d.	2 7 0
Ever Ready (5/–)	40	40	35/6	..	5 12 8
Falk Stadelmann	7½	7½	25/–	..	6 0 0
Ferranti Pref. ..	7	7	27/–	..	5 3 8
G.E.C. :					
Pref.	6½	6½	33/9	..	3 17 0
Ord.	20	17½	87/6	..	4 0 0
Greenwood & Batley	15	15	35/–	..	8 11 6
HallTelephone(10/–)	10	12½	21/9	..	5 15 0
Henley's (5/–) ..	20	20	23/9	..	4 4 2
4½% Pref. ..	4½	4½	23/–	..	3 18 5
Hopkinsons ..	15	15	54/6	–6d.	5 10 0
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	32½	30	117/6	..	5 2 0
Johnson & Phillips	15	15	64/6	..	4 12 4
Lancashire Dynamo	20	20	76/6	..	5 4 8
Laurence,Scott(5/–)	15	12½	10/–	..	6 5 0
London Elec. Wire	7½	7½	30/–	+6d.	5 0 0
Lucas, J.	15	15	71/3	–2/–	4 4 0
Mather & Platt ..	10	10	45/–	..	4 9 0
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	97/6	..	4 2 0
Pve Deferred (5/–)	25	25	20/–	+6d.	6 5 0
Revo (10/–) ..	20	17½	34/–	..	5 3 0
Reyrolle	12½	12½	62/–	..	4 0 7
Siemens Ord. ..	7½	7½	28/6	..	5 5 2
Smith, S. (1/–) ..	50	37½	9/3	..	4 1 1
Strand Elec. (5/–)	4	7½	5/6	..	6 16 4
Switchgear & Cowans (5/–) ..	15	10	11/3	+1/16	4 9 0
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	45/–	..	4 9 0
Telephone Mfg.(5/–)	9	9	11/–	..	4 1 10
Thorn Elec. (5/–)	20	20	19/–	..	5 5 3
Tube Investments	23¾	20	89/6	..	4 9 3
Vactric (5/–) ..	Nil	Nil	9/–	+9d.	—
Vickers (10/–) ..	10	10	18/6	..	5 8 1
Ward & Goldstone (5/–)	20	20	20/6	..	4 17 7
Westinghouse Brake	10	10	57/6	+1/4	3 9 5
Walsall Conduits(4/–)	55	55	41/3	–1/16	5 6 6
West, Allen (5/–)	7½	7½	6/6	+6d.	5 15 5

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 733)

company directly controls Ferranti Electric, Ltd., incorporated in Ontario, and Ferranti Electric, Inc., incorporated in New York. The ordinary shares are all privately held and the 7 per cent. preference at their present price of 27s. give a return of £5 3s. 8d. per cent. on the money.

Rangoon Electric

The progress of war developments in Burma has recently been satisfactory enough to encourage the impression that General Wavell has made up his mind to recapture Burma for the British Empire. From the purely material point of view, this has had a good effect upon the prices of shares in companies operating in that country. The Rangoon Electric Tramway and Supply Co. has called a meeting for December 18th in order that resolutions may be submitted for extending the power of the board. One of the company's articles provides that the directors shall be resident outside the United Kingdom, and this it is proposed to modify. Powers are also sought for the directors to prepare accounts in respect of the period from December 31st, 1940. The company's 4 per cent. debenture stock stands at about 68, and at the meeting next month, the payment of interest due on July 1st this year, will be proposed.

South American Utilities

The clearing of the enemy from the north-west coast of Africa and the areas around Dakar is regarded as being of importance to companies with interests in South American trade and commerce. It may be stretching the argument rather too far, but some people maintain that the freeing of the South Atlantic from the menace of the U-boat danger is a bull point in favour of South American undertakings. For this reason, Argentine, Brazilian and Chilean stocks and shares have come into greater notice, with prices moving upwards. Quotations show no particular variation, but the speculative buyer is on the lookout for cheap stock in companies concerned with public utility works in South America, which, for some time past, have been practically neglected by speculator and investor alike.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.*2.

1939

33107. "Electrical communication systems." Telephone Manufacturing Co., Ltd., and L. H. Paddle. January 30th, 1941. (549002.)

1940

13162. "Electric torches." J. S. Webster. August 17th, 1940. (549104).

16819. "Automatic control systems for aircraft." Sperry Gyroscope Co., Ltd., R. H. Nisbet and A. P. Glenny. November 22nd, 1940. (549105.)

17178. "Damping devices, more especially for sensitive instruments such as gyro-compasses." Sperry Gyroscope Co., Inc. December 2nd, 1939. (549041.)

1941

333. "Transmission systems for sensitive instruments." Sperry Gyroscope Co., Inc. January 10th, 1940. (549042.)

351. "Manufacture of electric insulators." Standard Telephones and Cables, Ltd., and E. C. Lee. January 9th, 1941. (549043.)

968. "Facsimile signalling systems." Creed and Co., Ltd. and F. P. Mason. January 24th, 1941. (549076.)

1855. "Railway traffic controlling apparatus." Westinghouse Brake & Signal Co., Ltd., and C. F. D. Venning. February 11th, 1941. (549052).

2855. "Direct-current electric motor control systems." General Electric Co., Ltd., H. J. Coates, R. G. Jakeman and J. F. Prince. March 3rd, 1941. (549077.)

2873. "Fastening means for a detachable piece of a clamping or spring-pressure applying device." English Electric Co., Ltd., and E. H. H. Hassler. March 3rd, 1941. (549078.)

4927. "Method of and apparatus for reproducing a television picture with a cathode-ray tube and separate light source." Ges. zür Forderung der Forschung auf dem Gebiete der Technischen Physik an der Eidgenossischen Technischen Hochschule. June 11th, 1940. (Addition to 543485.) (549008.)

5131. "Electrical screening devices." C. F. Lumb. April 21st, 1941. (549110.)

5355. "Facsimile telegraph systems." Standard Telephones & Cables, Ltd. April 26th, 1940. (549010.)

5450. "Treatment of organo-silicols, and products thereof." British Thomson-Houston Co., Ltd. April 30th, 1940. (549081.)

5514. "Electrical signalling systems utilising trains of impulses for control purposes." Automatic Telephone & Electric Co., Ltd., R. Taylor and G. T. Baker. April 28th, 1941. (549047.)

5586. "Electrolytic cells." E. I. Du Pont de Nemours & Co. May 1st, 1940. (549014).

5600. "Arrangements for charging secondary electric batteries." Standard Telephones & Cables, Ltd., and E. A. Richards. April 30th. 1941. (Addition to 538843.) (549018.)

5644. "Control elements such as knobs, dials, switch handles, and similar devices." Marconi's Wireless Telegraph Co., Ltd. May 1st, 1940. (549048.)

5725. "Ultra-short-wave antenna system." Standard Telephones & Cables, Ltd. May 17th, 1940. (549085.)

5755. "Welding transformer." G. G. Glenn. May 2nd, 1941. (549057.)

5802. "Electrolytic cells." Imperial Chemical Industries, Ltd. (E. I. Du Pont de Nemours & Co.). May 5th, 1941. (549148.)

5847. "Methods of and apparatus for burning finely divided solid fuel in suspension." Babcock & Wilcox, Ltd. July 31st, 1940. (549151.)

5871. "Electric regulators for dynamo-electric machines." British Thomson-Houston Co., Ltd. May 7th, 1940. (549022.)

7149. "Device for attaching a magnifying glass or lens to electric-light shades or reflectors." L. Pryor. June 6th, 1941. (549025.)

7339. "Electric measuring instruments." Everett, Edgcumbe & Co., Ltd., and C. Coleman. June 10th, 1941. (549116.)

8662. "Current transformers." British Thomson-Houston Co., Ltd. July 11th, 1940. (549122.)

8909. "Electrical control systems employing vacuum tubes operating with secondary emission." British Thomson-Houston Co., Ltd. July 13th, 1940. (549125.)

9004. "Devices for joining together or anchoring the ends of flexible elements such as stranded wire cables." J. S. Highfield. July 16th, 1941. (549161.)

9062. "Mechanical braking systems." G. D. Smith and Metropolitan-Vickers Electrical Co., Ltd. July 17th, 1941. (549062.)

9596. "Dynamo-electric machines." A. Tustin and Metropolitan-Vickers Electrical Co., Ltd. July 29th, 1941. (549063.)

9998. "Means for reducing equalising oscillations occurring with multi-pole surges in electrical transformers." Akt.-Ges. Brown, Boveri & Cie. December 24th, 1940. (549032.)

10512. "High-frequency transmission lines." E. W. Hayes. August 18th, 1941. (549132.)

10528. "Leading-in arrangements for vacuum or gas-filled electric-discharge devices." British Thomson-Houston Co., Ltd., H. K. Bourne and E. J. G. Beeson. August 19th, 1941. (549135.)

10615. "Electric gas-lighting devices." J. M. Jackson. August 20th, 1941. (549164.)

10781. "Flashlight lamps." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). August 23rd, 1941. (549136.)

11159. "Newspaper conveyors." Igranic Electric Co., Ltd., and H. H. Rapley. September 1st, 1941. (549067.)

11923. "Electric primary batteries." General Electric Co., Ltd., and R. W. W. Sanderson. September 17th, 1941. (549036.)

12518. "Electric accumulators." Chloride

Electrical Storage Co., Ltd., and R. Gray. September 26th, 1941. (549037.)

1942

3118. "Street lighting devices." Concrete Utilities, Ltd., and C. A. Marques. March 10th, 1942. (549098.)

3348. "Blade fastening for turbines." Westinghouse Electric International Co. March 8th, 1941. (549100.)

11926. "Electrical signalling systems utilising trains of impulses for control purposes." Automatic Telephone & Electric Co., Ltd., R. Taylor and G. T. Baker. April 28th, 1941. (Divided out of 549047.) (549074.)

12269. "Laminated or fabricated structures formed wholly or in part of cellulosic material." G. R. Shepherd (Westinghouse Electric International Co.). March 20th, 1941. (549039.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Orders Placed

Birmingham.—Electricity Committee. Accepted from April 18th to November 7th:—Supply and erection of metalclad switchgear and feeder reactors.—General Electric Co., Ltd. Supply and erection of compressed-air pipework.—Stewarts & Lloyds, Ltd. Supply and delivery of consumers' e.h.v. switchgear panels for a period of two years from July 1st, 1941.—George Ellison, Ltd. Modification of switchgear at substation.—Ferguson Pailin, Ltd. Supplemental contract for the supply and delivery of two 500-kVA and three 200-kVA out-door type transformers.—Electric Construction Co., Ltd. Renewal of short stack ducting at power station.—International Combustion, Ltd. Supplemental contract for one additional 1,200-kVA transformer and one additional 20,000-kVA transformer at substation.—British Thomson-Houston Co., Ltd. Renewal of short steel chimneys.—John Thompson (Dudley), Ltd. Supplemental contract for the supply, etc., of additional electrostatic flue gas cleansing plant.—Lodge-Cottrell, Ltd.

Glasgow.—Transport Committee. Accepted. Dry cells (year's supply).—Siemens Bros. & Co., Ltd. Covered wire.—London Electric Wire Co. & Smiths, Ltd.; British Insulated Cables, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Brighouse.—Canteen; Ramsden, Camm & Co., Ltd., wire manufacturers.

Caernarvonshire.—School, Edern; W. Lloyd Jones, county architect, County Offices, Caernarvon.

Carlisle.—Fire station; city engineer, 18, Fisher Street.

Chelmsford.—Canteen; Christy & Norris.

Coventry.—British Restaurant, Holbrook Lane; D. E. E. Gibson, city architect, 1A, Warwick Row.

New headquarters; G. Haines, hon. secretary, Coventry and District Crippled Children's Guild, 33, Holyhead Road.

Denby Dale.—British Restaurants at Denby Dale, Clayton West, Scissett and Skelmanthorpe; U.D.C. surveyor, Wakefield Road, Denby Dale, Skelmanthorpe.

Essex.—Nurseries, Hornchurch and Braintree, and secondary school, Hornchurch; county architect, Chelmsford.

Gateshead.—Canteen for Hugh Wood & Co.; Couves & Partners, Carliol House, Newcastle-on-Tyne.

Glasgow.—Factory and machinery for construction of concrete slabs for housebuilding (£25,000); city architect.

Hampshire.—School kitchens (£4,690); county architect, Winchester.

Hoole.—British Restaurant at All Saints' Mission Room; U.D.C. surveyor, Elms Hoole Road, Chester.

Hull.—Canteen, Old Harbour; Gelder & Kitchen, architects, 120, Sir Alfred Gelder Street.

Huntingdon.—Wartime nursery, Ambury Road; Surveyor's Office, Town Hall.

Kent.—School canteens (£8,000), six youth centres, improvements at various emergency hospitals (£7,995) and nurses' accommodation at County Hospital, Farnborough (£2,000); county architect, Maidstone.

Largs.—Rest shelter (£1,000); burgh surveyor, Municipal Chambers.

Leeds.—Additions to premises; Sunshine Laundry, Ltd., Wilson Road, Bramley.

Leicestershire.—School canteens (£5,865) and A.R.P. buildings, Coalville (£4,500); E. G. Fowler, county architect, County Education Offices, Greyfriars, Leicester.

Liverpool.—Youth centre; secretary, Council of Youth, Our Lady Star of the Sea, Crosby, Liverpool.

London.—ST. MARYLEBONE.—Rebuilding 115, Baker Street; J. Stanley Beard & Bennett.

BATTERSEA.—Repairs to Eaton House (£3,000); borough engineer.

Manchester.—Day nursery, Wythenshawe (£2,300); A. Hodkinson, Ltd., builders, 62, Greenhill Street, Manchester, 15.

Middlesbrough.—Brick canteens, High School and Lawson School; education architect, Woodlands Road.

Completion of partly built houses, and development of two housing estates; borough engineer.

Montgomery.—Adaptation of Market Hall, Llanidloes, as feeding centre; H. Carr, county architect, County Offices, Welshpool.

Moray and Nairn.—Midday meals scheme at eighteen schools (£5,963); county architect, County Buildings, Elgin.

Morpeth.—Canteen, Broomhill Colliery, for Miners' Welfare Commission; Mauchlen & Wightman, architects, 12, Saville Row, Newcastle-on-Tyne.

Newcastle-on-Tyne.—Further school shelters; contractors, John Craven & Sons and W. Leech.

Classrooms and kitchens, Blakelaw site; education architect, Northumberland Road, Newcastle.

North Riding.—Further repairs to Canon A. R. Lee Senior and Clifton Without Junior schools (£1,500); Jaram & Son, builders, Gladstone Street, Scarborough.

Northumberland.—Cooking depot, Ponteland, for Education Committee; R. C. Williamson, builder, Rowlands Gill.

Canteen, Haydon Bridge School; Watson & Son, builders, Haltwhistle.

Kitchen, Seaton Valley Astley Central School; F. Hope, builder, Gosforth.

School shelters at Millfield and Wallsend; contractors, Patterson Bros., Branxton, and F. Hope, Gosforth.

Nottingham.—Canteen, Pinxton; Pinxton Colliery Co. (F. D. Severn, manager), Colliery Offices, Pinxton.

Ossett.—Canteen, Calder Vale Mill; A. Metcalfe & Co., Ltd.

Additions; Rhodes & Halmshaw, Ltd.

Reigate.—Central kitchen, Colesmead Estate, Redhill, and kitchen at Hooley Mission Hall, Earlswood; G. G. Sanderson, borough engineer, Town Hall.

Seahouses.—Fish-packing station; Messrs. Norris.

Southampton. — Junior technical school; borough engineer.

Southend-on-Sea.—British Restaurant, Harcourt Hall; R. G. Baxter, borough engineer, Municipal Buildings.

Southgate. — Nursery, Winchmore Hill; borough engineer.

Staffordshire.—School canteen, Cheslyn Hay and Wyrley (£1,280); L. M. Coombs, county architect, County Buildings, Stafford.

Worcestershire.—Additions to school, Stoke Works; H. Rowe & Son, county architects, 38, Foregate Street, Worcester.

Worksop.—Wartime nursery, Colliery Grounds; King & Son, builders, Edenthorpe, Barnby Dun, Doncaster.

Wrexham.—Houses; J. England, borough surveyor.

York.—New library buildings; Chancellor F. Harrison, librarian, Minster Yard, York.

Tanganyikan Imports

Electrical Purchases Decline During 1941

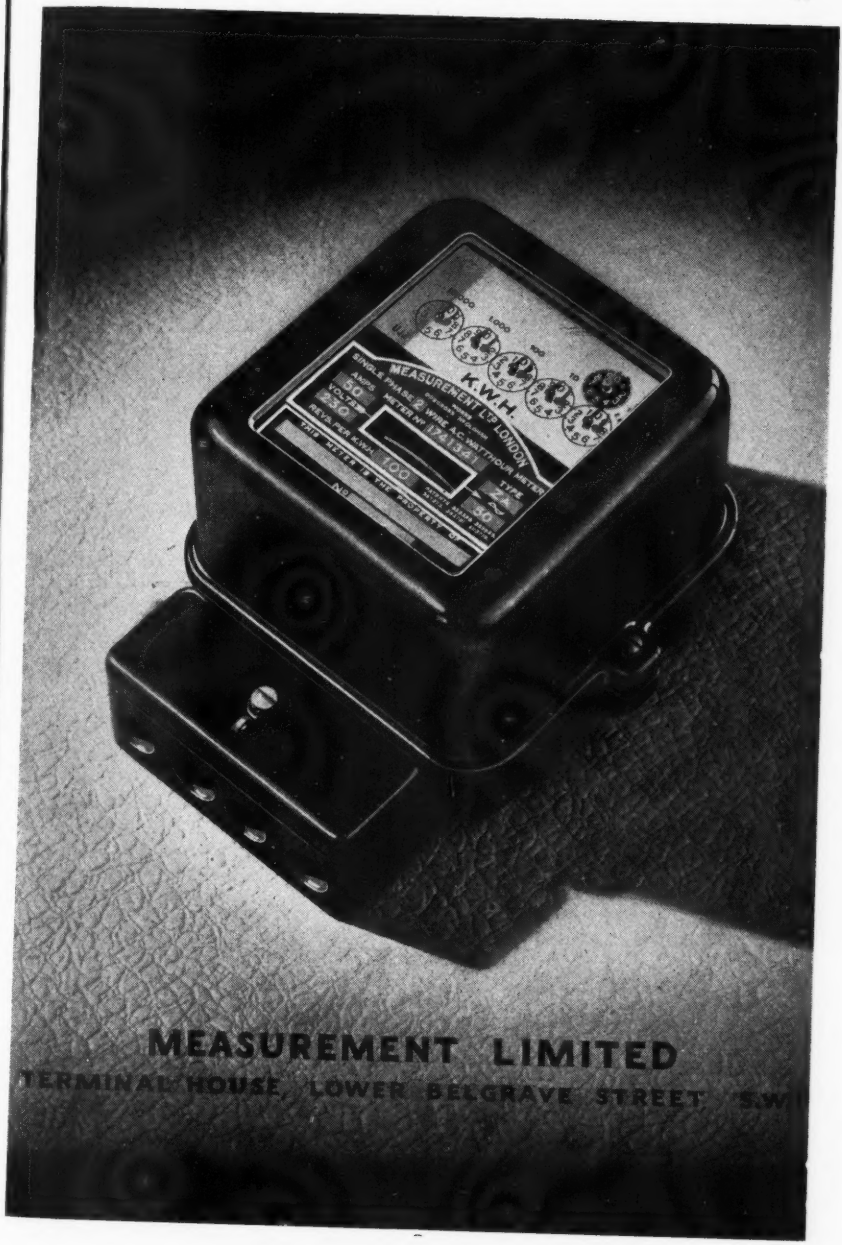
IN spite of extra activities due to participation in African campaigns no increases in the imports of electrical goods into Tanganyika were recorded in 1941. On the contrary there were substantial decreases in many lines. The decline was due mainly to the inability of supplying countries to cater for civilian requirements.

Enterprise in Tanganyika last year was applied chiefly to the production of foodstuffs and other materials needed in the prosecution of the war. Government policy at the same time was directed to the limitation of imports generally. It is fair to assume that in Tanganyika there is a latent demand for electrical goods.

The accompanying table gives the values in 1941 of the principal groups, with the supplying countries, and notes of increases or decreases compared with 1940.

	1941 £	Inc. or dec. on 1940 £
Accumulators and batteries—		
Total	12,200	+ 3,800
From Great Britain	8,300	+ 3,400
„ South Africa	1,050	+ 450
„ Canada	700	+ 500
„ United States	1,600	— 800
Dynamos, motors and rotary convertors—		
Total	1,270	— 830
From Great Britain	1,300	— 300
„ United States	100	— 300
Lighting bulbs and tubes, domestic—		
Total*	1,540	— 760
Ditto for flashlights and handlamps—		
Total	200	+ 70
From Great Britain	140	+ 24
„ Hongkong	35	+ 35
Other lighting bulbs and tubes—		
Total†	10	— 130
Portable or domestic tools and appliances—		
Total	72	— 148
From Great Britain	60	— 140
„ Belgium	12	+ 12
Cable and wire—		
Total*	4,530	— 6,170
Telegraph and telephone instruments and apparatus—		
Total*	390	— 6,010
Radio receiving sets, complete—		
Total	4,660	+ 760
From Great Britain	3,230	+ 1,530
„ South Africa	230	+ 210
„ United States	860	— 340
Other radio apparatus—		
Total	1,300	— 400
From Great Britain	740	— 60
„ United States	550	— 50
Other electrical machinery, goods and apparatus—		
Total	24,800	— 1,000
From Great Britain	22,600	— 1,400
„ Hongkong	1,020	+ 910
„ United States	816	+ 116

* Mainly from Great Britain.
† „ „ United States.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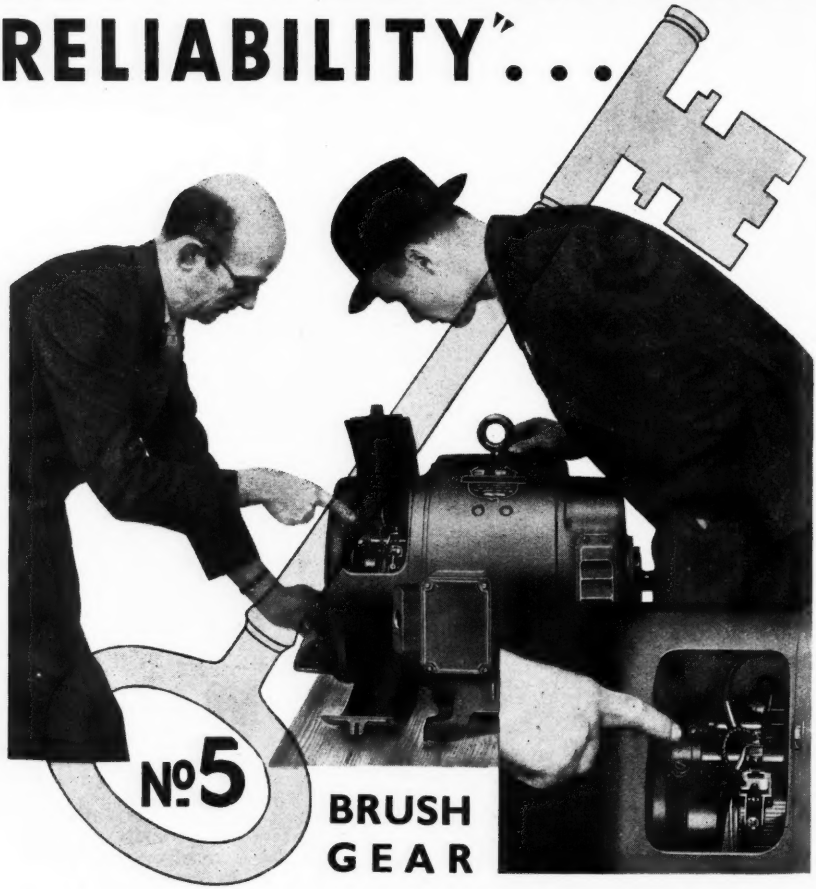

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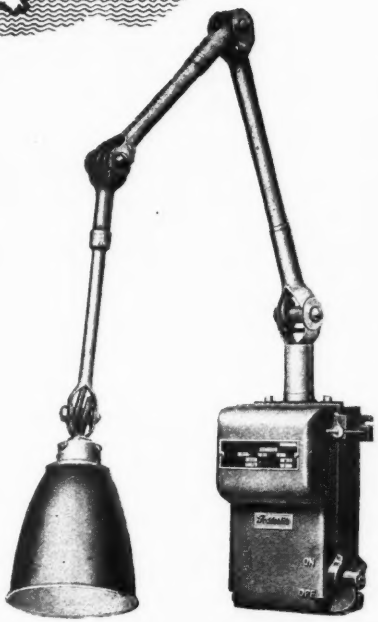

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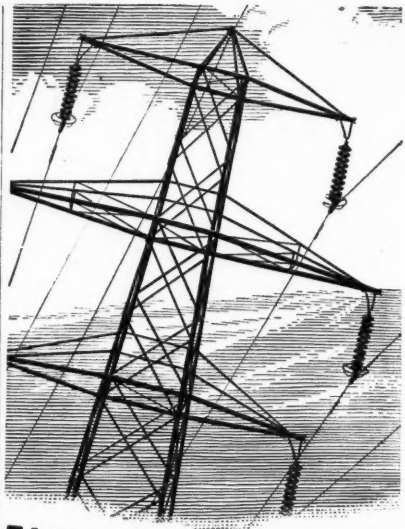

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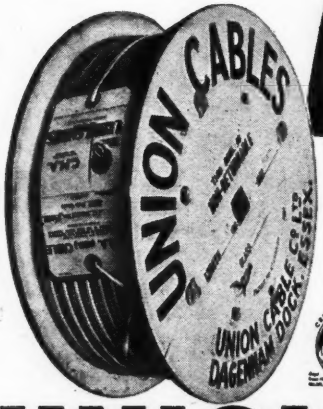

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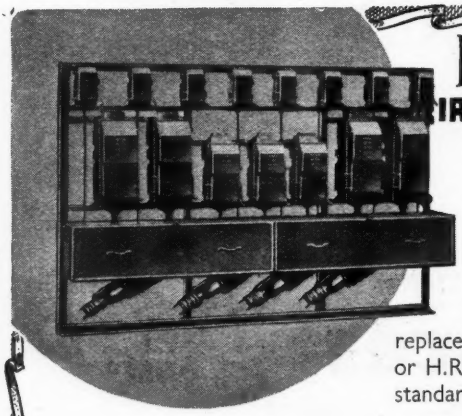

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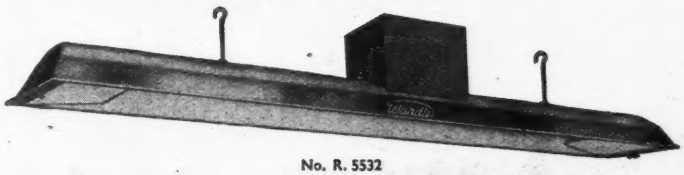

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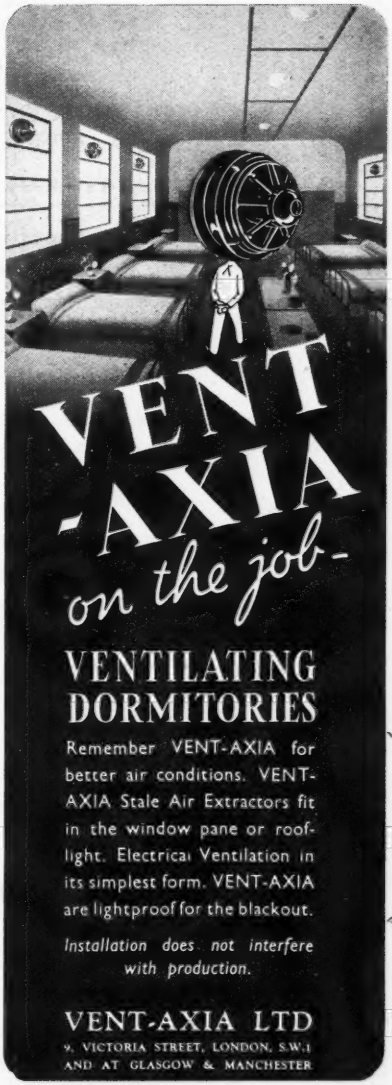
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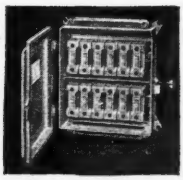

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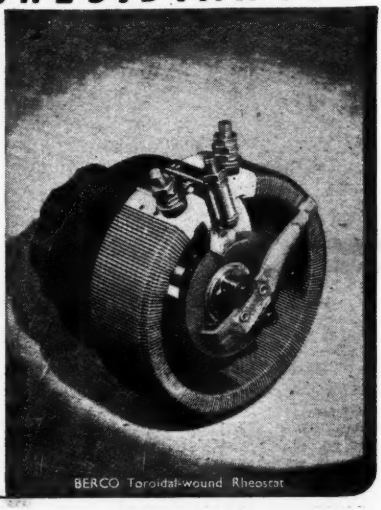

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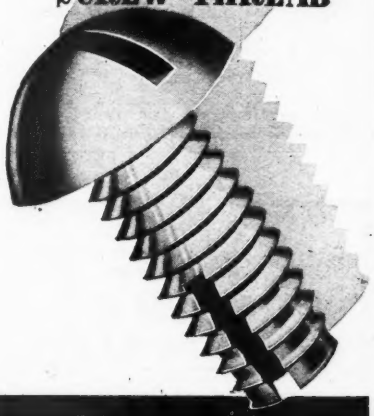

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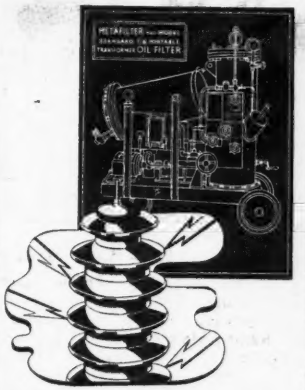

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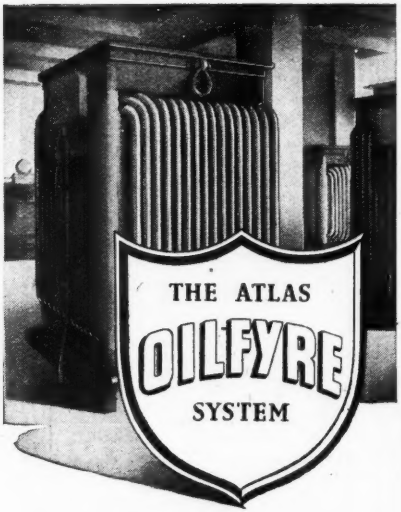

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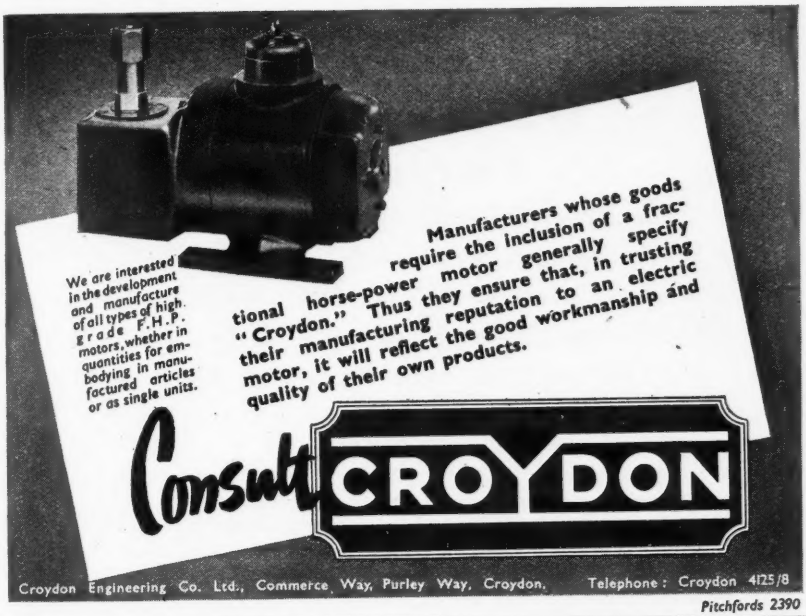
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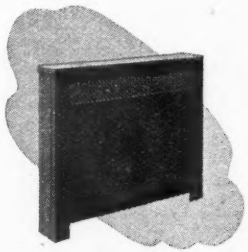

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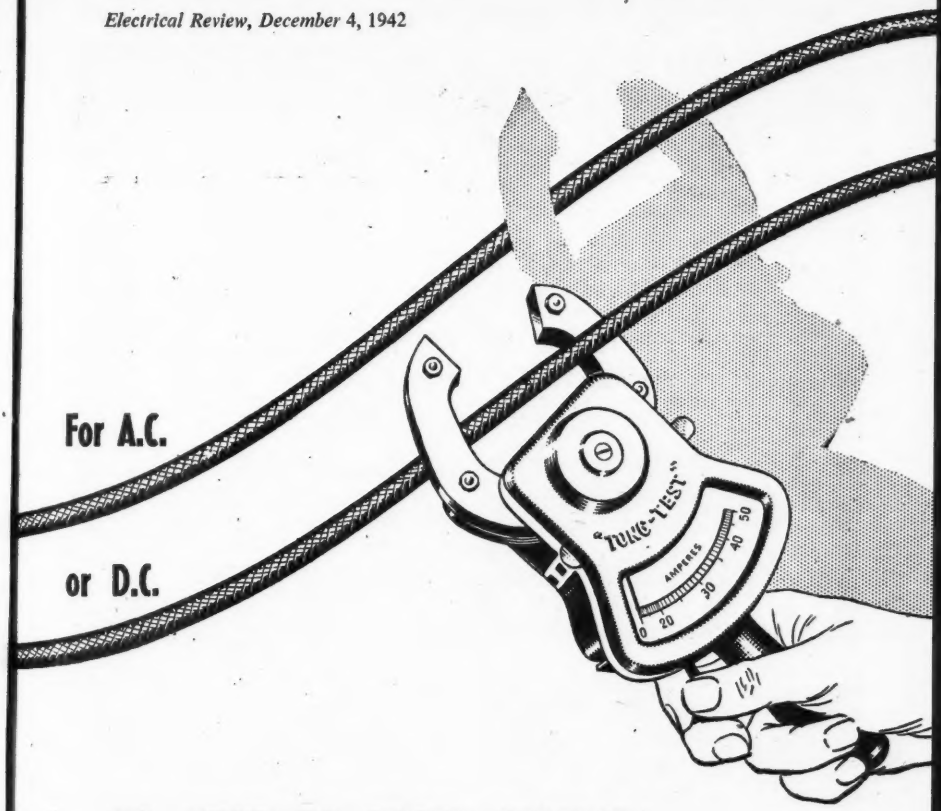

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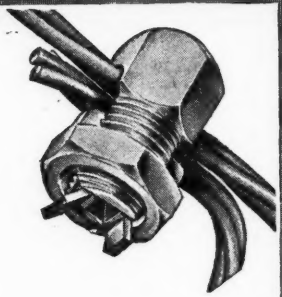

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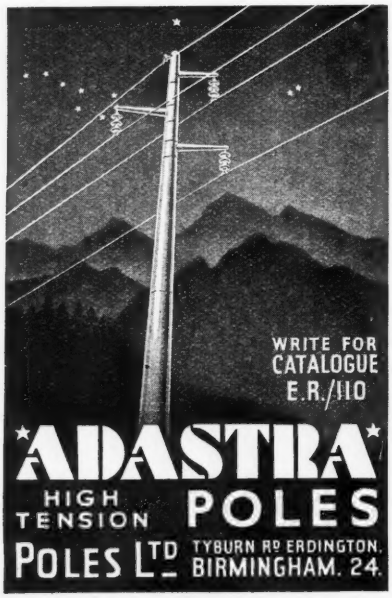

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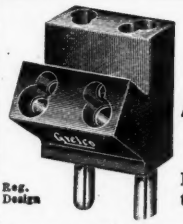

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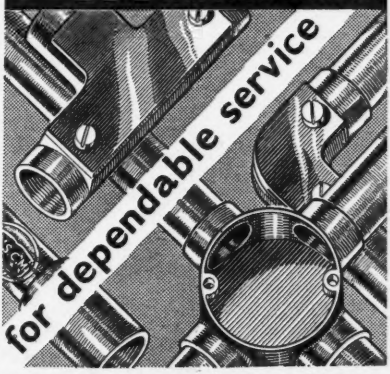

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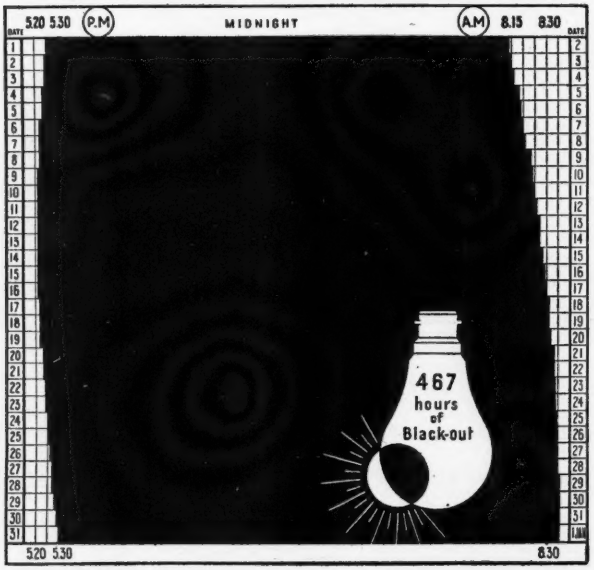

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